

SELF-EFFICACY EXPECTATIONS AND CAUSAL ATTRIBUTIONS
FOR ACHIEVEMENT AMONG MALE AND FEMALE
UNIVERSITY FACULTY

By

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The purpose of this study was to test empirically a model of research self-efficacy among university faculty. The study was designed to extend the theoretical model by testing the relationships between research self-efficacy and research performance and between research self-efficacy and causal attributions for achievement. An additional goal of the study was to examine sex differences among university faculty in their research self-efficacy beliefs, frequency of performance of research tasks, and in other career and demographic variables.

The subjects were full-time faculty members, randomly selected, from the colleges of Business Administration, Education, Engineering, Health Related Professions, Agriculture, Liberal Arts and Sciences, Nursing, and Pharmacy. Two hundred eighty-four faculty members

responded, yielding a 66% response rate. Respondents completed a questionnaire that measured research self-efficacy beliefs, research productivity, causal attributions, frequency of performance of research tasks, and demographic and career information.

Results of multiple regression analyses provided empirical support for the research self-efficacy model. The relationships between research self-efficacy and research productivity and between research self-efficacy and causal attributions were statistically significant. Partial support was obtained for the Low Expectancy model of sex differences in attributional patterns. Significant sex differences in the expected direction were found in self-efficacy beliefs and the frequency of performance of research activities. Male faculty members reported significantly higher self-efficacy perceptions and spent significantly more time performing research tasks than did female faculty. Results were discussed in terms of their relationship to theory and previous research. Finally some suggestions for further study were proposed.

CHAPTER 1

INTRODUCTION

Statement of the Problem

According to self-efficacy theory (Bandura, 1977a, 1986) one of the most important influences on behavior is individuals' self-efficacy beliefs (perceptions about their ability to successfully perform a given behavior). Bandura has posited that self-efficacy beliefs influence whether a behavior will be initiated, the amount of effort expended, and persistence in performance of behaviors.

Self-efficacy in university faculty has been the focus of recent empirical study (Landino & Owen, 1988; Schoen & Winocur, 1988). Landino and Owen (1988) investigated the effect of performance accomplishments (academic rank, highest degree held, and scholarly productivity), vicarious learning, gender, age, and years of experience in higher education on three measures of academic self-efficacy (research, service, and teaching self-efficacy) and found that gender contributed to research self-efficacy indirectly. Being female contributed to feeling less confident about research tasks, via the mediating effects of not holding a PhD, producing fewer articles, and feeling less mentored. Contrary to Bandura's (1986) model, Landino

and Owen (1988) did not find performance accomplishments to be related to self-efficacy. A weakness in their study was that although the influence of self-efficacy beliefs on performance was assumed, this relationship was not explicitly tested. A complete test of Bandura's self-efficacy model necessitates establishing the link between self-efficacy beliefs and actual behavior.

Although Schoen and Winocur (1988) found that females reported being less confident than males for research tasks and more confident than males for teaching tasks, the results were not statistically significant. One of the methodological weaknesses in the study that may have contributed to the nonsignificant findings was the low response rate (37%), suggesting the possibility of a biased sample of university faculty. Furthermore, the authors suggested that additional research is needed to refine and validate their Academic Self-Efficacy Scale (AS-ES). In view of the weak support for self-efficacy theory provided by these two studies, replications with an improved methodology are needed.

The development of academic self-efficacy expectations may also be influenced by attributions concerning the causes of success and failure experiences. Bandura (1977a) suggested that cognitive appraisals of the causes of one's behavior (i.e., whether the behavior is attributed to internal factors, such as ability or effort, or to external

factors, such as luck) may influence whether successful task performance will increase efficacy expectations.

Thus, in addition to the antecedent variables that Landino and Owen tested, a model of academic self-efficacy should also incorporate the concept of causal attributions for success and failure. It is likely that causal attributions play a mediational role between performance accomplishments, such as publishing academic articles and academic self-efficacy. Bandura (1986) also noted that self-efficacy beliefs, in turn, influence the types of performance attributions individuals make. For example, Collins (cited in Bandura, 1986) found that children who believed themselves to be highly efficacious attributed their failures to lack of effort, whereas those who considered themselves to be inefficacious attributed their failures to low ability.

Despite legislative advances, affirmative action, and dramatic increases in the number of women among university students, women continue to be underrepresented among university faculty and concentrated in the lower ranks (Finkelstein, 1984; Schoen & Winocur, 1988; Simeone, 1987). In 1985-86 women held 28% of all faculty positions (American Council on Education, 1989). Inequities in rank have also been documented; for example, in 1985-86 only 11.9% of all full professors were female, whereas 52% of all instructors were female (American Council on Education, 1989). These statistics suggest that women advance up the academic

hierarchy more slowly than their male counterparts and are more likely never to advance to the top. This situation is of considerable importance because university faculty play a significant role in socializing students and in providing gender role models. Furthermore, academic scholarship contributes to defining and extending our cultural base of knowledge, and thus, as Simeone (1987) has noted, "Insofar as women are excluded from creating and disseminating knowledge, an incomplete, indeed harmful, picture of the world is painted" (pp. 2-3).

To date, much of the literature on women's present status in academia has been descriptive rather than explanatory (e.g., Simeone, 1987). Research based on sound theoretical frameworks is required to advance our knowledge in this area and to provide guidelines for establishing intervention programs aimed at promoting gender equity in academia. Deaux (1984) noted that gender alone is not a useful explanatory concept. Typically gender only accounts for a small amount of the variance in any given behavior, and main effects by gender are often qualified by interactions with situational factors. Self-efficacy theory (Bandura, 1977a, 1986) provides potential explanations for women's current status in academia. The model is particularly applicable in that it emphasizes both personal and environmental variables. In recent years a number of writers in the field of gender psychology have highlighted the need for research that focuses on the situational and

social factors that affect behavior and hence create observed gender differences (Deaux, 1984; Deaux & Major, 1987; Hare-Mustin & Marecek, 1988; Mednick, 1989). Furthermore, self-efficacy theory goes beyond merely describing the effects of socialization by providing explanations for how socialization translates into behavior via the mediating cognitive process of self-efficacy perceptions.

Purpose of the Study

The purpose of this study was to investigate (a) the effect of research self-efficacy on research performance (productivity), (b) the influence of several variables on research self-efficacy, in particular attributions for success and failure, (c) the influence of self-efficacy beliefs on the types of attributions made by male and female university faculty, (d) gender differences in research self-efficacy beliefs, and (e) gender differences in the amount of time spent performing research tasks. More specifically, the purpose of this study was to test the following hypotheses:

1. Research self-efficacy predicts research performance (productivity) after controlling for the effects of years of experience, rank, and college affiliation.
2. Causal attributions explain additional variance in research self-efficacy, over and above that explained by research productivity.

3. Self-efficacy beliefs interact with faculty sex to influence causal attributions (i.e., the magnitude of sex differences in attributions varies with self-efficacy beliefs).

4. Faculty women's research self-efficacy beliefs are lower than those of men's.

5. Faculty women invest less time in research tasks than men.

Significance

Applications of self-efficacy theory to a variety of career choice and performance outcomes have been empirically supported (e.g. Betz & Hackett, 1981, 1983; Post-Kammer & Smith, 1985; Taylor & Betz, 1983). Self-efficacy in university faculty has only recently been studied (Landino & Owen, 1988; Schoen & Winocur, 1988).

Lent and Hackett (1987) have noted that although the relationship of self-efficacy beliefs to career-related behaviors has been demonstrated, causal connections among these variables have not been established. Recently, Landino and Owen (1988) and Schoen and Winocur (1988) explored self-efficacy in university faculty, incorporating variables from self-efficacy theory and characteristics of the university work environment. Their studies, however, resulted in only weak support for self-efficacy theory. Methodological weaknesses in the studies may have accounted for the failure to obtain stronger support for the theory.

The present study was designed to determine if an improved methodology would provide stronger empirical support for self-efficacy theory. In particular this study extended the work of Landino and Owen by testing additional important variables and relationships. More specifically, the relationships between research self-efficacy and causal attributions for achievement and between research self-efficacy and actual performance (productivity) were examined, thus providing a fuller test of the self-efficacy model. In addition, gender and self-efficacy were examined.

Women's position in academia has been the focus of much empirical attention. In general, studies have indicated that many personal, social, and situational factors contribute to women being underrepresented in the higher echelons of the academic hierarchy and experiencing more occupational barriers in their academic careers than males. More specifically, factors, such as female faculty investing more time in teaching and less in research, and hence publishing less (Helmreich, Spence, Beane, Lucker, & Matthews, 1980; Simeone, 1987), and female faculty receiving lower evaluations on global teacher effectiveness and academic competence (Sidanius & Crane, 1989), have been implicated in creating this situation.

Although such studies contribute to our knowledge about women's present status in academia, a theoretical framework is needed to integrate empirical findings. A theoretical conceptualization that may be useful in providing

explanations for women's current position in academia is self-efficacy theory (Bandura, 1977a, 1986).

To date attribution theory has not been applied to the study of sex differences in university faculty. Despite Bandura's (1986) highlighting of the importance of cognitive appraisals in the incorporation of efficacy information (e.g., performance accomplishments) and the changing of efficacy perceptions, previous researchers have not examined the contribution of causal attributions to explaining variance in academic self-efficacy. The present study was designed to examine whether causal attributions for achievement explained variance in research self-efficacy beliefs in addition to the variance explained by productivity. Similarly, researchers have not examined the effect of self-efficacy beliefs on the types of performance attributions that male and female university faculty make. Deaux (1976, 1984) posited that sex differences in causal attributions will only emerge when initial expectancies for performance (conceptually similar to self-efficacy expectations) differ. Thus, one purpose of this study was to test Deaux's Expectancy Model of sex differences in causal attributions, by investigating if sex differences exist in patterns of causal attributions for performance of academic tasks among university faculty who perceive themselves to be either efficacious or nonefficacious.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

In this chapter literature relating to three topics is reviewed. The first section of the literature review focuses on self-efficacy theory, which provides a theoretical framework for explaining academic performance and for integrating empirical findings relating to the status of women faculty. Next, attribution theory, which may increase the explanatory power of a model of academic self-efficacy, is presented. Finally, the status of women in academia and the explanations that have been posited to account for their relatively low status are reviewed and considered in light of self-efficacy theory.

Self-Efficacy Theory

The importance of self-referent thought has been widely noted in psychological theory and research. Concepts such as personal causation (deCharms, 1978), locus of control (Rotter, 1966), and learned helplessness (Garber & Seligman, 1980) have been postulated and studied. Bandura's (1977a, 1986) self-efficacy theory posits that self-efficacy expectations (individuals' beliefs about their ability to

successfully perform a task) are important mediators of behavior. According to the model, self-efficacy beliefs influence whether or not a behavior will be initiated, the amount of effort expended, and persistence in performance.

Self-efficacy expectations vary on three dimensions. They differ in level, which refers to the degree of difficulty of tasks the individual feels capable of performing. They vary in generality, which refers to the extent to which an individual's efficacy beliefs generalize to different behavioral domains. Finally, efficacy expectations differ in strength, which involves the degree to which efficacy expectations are maintained in the face of disconfirming experiences (Bandura, 1977a, 1986).

Bandura (1977a) proposed four sources of information by which self-efficacy expectations are learned and modified: performance accomplishments or successful performances of the particular behavior; vicarious learning or modelling; emotional arousal by which people gauge their level of anxiety (high levels of anxiety usually serve to decrease self-efficacy and performance); and finally verbal persuasion, such as the support and encouragement of others. It is likely that these factors operate in the development of academic self-efficacy. Landino and Owen (1988) have suggested that in the academic field, performance accomplishments and vicarious learning are likely to be the most important sources of academic self-efficacy.

Bandura (1977a, 1986) has noted that efficacy information, such as successful task performance, will not change self-efficacy expectations unless this information is appropriately appraised by the individual and incorporated. "A distinction must, therefore, be drawn between information conveyed by environmental events and information as selected, weighed and integrated into self-efficacy judgments" (Bandura, 1986, p. 401). Many personal and situational factors influence how environmental information is cognitively appraised. Kazdin (1979) argued that in view of this, cognitive appraisal becomes a prior consideration to self-efficacy, and evidence is needed to show what kinds of cognitive appraisals are essential for efficacy enhancing information to be incorporated. Such information is particularly salient for developing programs aimed at increasing perceptions of personal efficacy.

One type of cognitive appraisal that is likely to be significant in achievement situations is individuals' causal attributions for success and failure. In other words, whether behavior is attributed to internal factors, such as ability or effort, or to external factors, such as luck, may influence whether successful task performance will increase efficacy expectations. Thus attributions concerning the causes of success and failure experiences may influence the development of academic self-efficacy expectations. It is also likely that individuals' perceptions of their academic effectiveness influence their performance attributions.

It is important to note that Bandura did not suggest that self-efficacy beliefs alone determine behavior. "To say that perceived self-efficacy operates as a common mechanism in personal change does not mean that other mechanisms do not also come into play in promoting change" (Bandura, 1984, p. 251). Many other variables, in conjunction with perceived self-efficacy, such as ability levels and incentives, can affect performance. A fundamental principle of the social learning approach is that behavior is multiply determined, and therefore no single factor accounts for any given behavior. Despite such qualifications, self-efficacy theory has been criticized for failing to credit the importance of other variables in behavior change (e.g., Eastman & Marzillier, 1984).

✓ — Bandura's distinction between outcome and efficacy expectations has been a matter of contention. Bandura (1977a, 1986) argued that outcome expectations should be distinguished from efficacy expectations. An outcome expectation, which is a central concept in the expectancy-value approach (Ajzen & Fishbein, 1980; Mitchell & Beach, 1976) is defined as the individual's beliefs that once a given behavior is performed, certain outcomes will ensue. Efficacy expectations, on the other hand, are defined as individuals' appraisals of whether or not they can perform the behaviors required to produce the outcomes. Bandura (1977a) pointed out that the distinction is made because an individual can believe that performance of a

specific act will result in desired outcomes, but if that individual has low self-efficacy expectations regarding the action, such information will not influence his/her behavior (i.e., the task will not be attempted).

Eastman and Marzillier (1984) argued that considerations of outcome expectations cannot be excluded from efficacy expectations, in that behavior is determined not only by an individual's perception of his/her competency to perform a behavior but also by his/her perception of the outcomes consequent to the action. To exemplify this point, they described a situation in which two individuals have the same efficacy expectations about their ability to cope with a situation, but one believes that failure will lead to very negative consequences, whereas the other believes that only mildly negative outcomes will ensue. Eastman and Marzillier contend that these differing outcome beliefs will lead to different behaviors. The former individual may, for example, avoid performing the behavior, whereas the latter may not.

Bandura (1984), however, argued that the types of outcomes individuals predict are largely contingent on their expectations of their competency to perform in particular situations: "It is because people see outcomes as contingent on the adequacy of their performance, and care about those outcomes, that they rely on self-judged efficacy in deciding which course of action to pursue" (p. 235).

Empirical research has tended to support Bandura's contention that outcome beliefs are highly dependent on perceptions of self-efficacy. Self-efficacy has been found to predict a greater proportion of variance than outcome expectations in a wide range of behavioral domains, including assertiveness, smoking cessation, and athletic feats (Bandura, 1986).

Self-Efficacy in University Faculty

Until recently, self-efficacy in university faculty had not been investigated. Hackett, Betz, and Doty (1985), however, developed a taxonomy of the competencies requisite to women's successful pursuit of academic careers that could be used to determine self-efficacy in this behavioral domain. This classification includes job-specific skills involved in teaching and research as well as more general skills such as interpersonal skills, communication skills, and political skills.

Schoen and Winocur (1988) examined the academic self-efficacy expectations of male and female university faculty, in an attempt to explicate the factors that contribute to the underrepresentation of female faculty in the senior ranks of the profession. Academic self-efficacy was operationally defined in terms of the individual's ability to perform various tasks in three major areas: teaching, research, and administration. Sex differences in perceived self-efficacy were obtained in the expected

direction, with females being less confident than males for research tasks and more confident than males for teaching tasks, although these differences failed to reach statistical significance. Females were most confident in performing teaching tasks, followed by administrative tasks, and lastly research tasks. Male confidence ratings were highest for teaching tasks, followed by research and administrative tasks, and lastly miscellaneous tasks. The study also found that females performed teaching tasks more frequently than males.

Landino and Owen (1988) tested a causal model of academic self-efficacy, incorporating 12 antecedent variables, including gender, age, years of experience in higher education, academic rank, academic degree, research productivity, and social support. Academic self-efficacy was operationalized as the individual's perceived confidence in his/her ability to perform various tasks in three domains: research, teaching, and service. Sex differences in perceived self-efficacy were found in the research domain, with females feeling less confident about research tasks via the mediating effects of not holding a PhD, writing fewer articles, being in departments with high proportions of women, participating in fewer professional networks, feeling less mentored, and feeling less supported by their department.

Women's Career Development:
The Role of Self-Efficacy Expectations

Hackett and Betz (1981) were the first to advocate including self-efficacy (Bandura, 1977a, 1986) as an important explanatory variable in models of career choice and development. Their application of self-efficacy theory to the career domain focused on how self-efficacy expectations develop differently in males and females as a result of differing socialization experiences and differential access to the four sources of efficacy information (performance accomplishments, vicarious learning, verbal persuasion, and emotional arousal).

According to the model, self-efficacy is a mediating cognitive process that links socialization to subsequent career choice and achievement behaviors. Thus a major strength of the conceptualization proposed by Hackett and Betz is that rather than merely describing the effects of socialization on women's career choices it explains how socialization experiences are translated into occupational behavior (i.e., via the mediating influence of self-efficacy). Hackett and Betz (1981) proposed that lower self-efficacy beliefs in females may partly account for the disadvantaged position of women in the work force.

While low self-efficacy expectations undoubtedly affect the career behavior of both women and men, the continuing limited and disadvantaged position of women in the labor force and the limited range of career options from which most women choose may be due, at least in part, to differential expectations of self-efficacy among women versus men. (p. 329)

Although Hackett and Betz's (1981) conceptualization of the relationship between self-efficacy and career choices applies equally to both males and females, the emphasis in the research ensuing from their work has been on extending our knowledge of women's career development. Astin (1984) has argued that although Hackett and Betz proposed that women's career choices result from low self-efficacy, an alternative interpretation of their model could lead to a different conclusion:

If we accept their premise that self-efficacy results from "successful performance of a given behavior," we could well conclude that women's preference for and choice of certain occupations are based on strong self-efficacy expectations resulting from the successful performance of service and nurturant activities. (p. 119)

Although women may feel efficacious in performing certain traditionally female occupations, Hackett and Betz's interpretation of women's career choices being influenced by low self-efficacy is of greater relevance in that much of the research in women's career choice has been concerned with the concentration of women in a small number of low-paying and low status occupations. Low self-efficacy beliefs in relationship to traditionally male occupations and activities (e.g., science and technology) contribute to this situation. Astin's position lacks utility in that society typically places a greater premium on traditionally male occupations than on traditionally female occupations.

Empirical evidence has supported Hackett and Betz's extension of self-efficacy theory to the career domain. A

major focus in studies of career self-efficacy has been career and academic choice. For example, Betz and Hackett (1981) investigated the relationship of career self-efficacy expectations to perceived career options in male and female college students. Males reported equivalent overall self-efficacy across traditionally male and female occupations, whereas females reported lower self-efficacy for traditionally male occupations and higher self-efficacy for traditionally female occupations. In addition, the researchers found that self-efficacy expectations influenced the nature and range of career options considered by both male and female college students.

Clement (1987) identified a methodological weakness in this study in the measurement of self-efficacy. Betz and Hackett assessed self-efficacy using two separate measures: self-efficacy level (whether or not the individual feels able to perform the task) and self-efficacy strength (the individual's confidence in his/her capability). Subjects were asked to rate whether they would be able to perform the tasks involved in various occupations and, if so, their confidence in their ability to perform the tasks. As Clement pointed out, this format for measuring self-efficacy is problematic. For example, an individual may report that she can do the job of an accountant (level) and then rate herself as having no confidence in her ability to perform the job duties of an accountant (strength), thus creating discrepant information. A solution to this problem is to

use a single-judgment measure of self-efficacy strength that includes zero to indicate the "I could not do that" judgment.

Using such a measure, Clement (1987) examined male and female college students' self-efficacy expectations in relation to various traditionally male and traditionally female occupations and their occupational preferences. Females reported lower self-efficacy for all but one of the traditionally male occupations. The males, in contrast, did not indicate low self-efficacy for most of the traditionally female occupations. Clement, however, unlike Betz and Hackett (1981), did not find evidence of women's lower self-efficacy deterring them from considering entering traditionally male occupations.

Post-Kammer and Smith (1985) replicated the Betz and Hackett (1981) study using a sample of college-bound high school students. In accordance with Betz and Hackett's findings, gender differences in self-efficacy for particular traditionally male and female occupations were revealed, although across fewer occupations than found in the Betz and Hackett study.

Wheeler (1983) examined the comparative utility of the self-efficacy and expectancy-valence models for determining occupational preferences among male and female college students. Results showed that both occupational valence and self-efficacy expectations explained unique variance in occupational preferences, thus providing empirical support

for both models. Perceived self-efficacy, however, was found to be more highly related to occupational preference than was occupational valence. Sex differences in perceived self-efficacy emerged and were related to the proportion of males in an occupation. In other words, although both males and females perceived themselves as having lower self-efficacy for male-dominated professions than for female-dominated professions, the relationship was stronger for females.

A methodological problem in this study arose from the use of a format for the measurement of self-efficacy expectations that differed substantially from the format suggested by Bandura (1977a) and that employed by career self-efficacy researchers (e.g., Betz & Hackett, 1983). Two measures of self-efficacy were used: a perceived "match of abilities" for each occupation and a perceived "ease of success" in each occupation.

Another major focus in the research on sex differences in career self-efficacy has been on perceived mathematics self-efficacy. The main impetus for this research focus has been the recognition of the importance of an adequate educational background in mathematics for entry into a wide range of technical and scientific careers. Another motivation for this research interest has been the persistent findings of gender differences in math achievement and career choice. Betz and Hackett (1983) found that the mathematics self-efficacy expectations of

college males were significantly stronger than those of college females and furthermore that these expectations were related to the extent to which students selected science-based majors. They also found that math self-efficacy was a better predictor of college major than a number of other variables such as math attitude measures and math aptitude scores.

Siegal, Galassi, and Ware (1985) examined the comparative utility of a social learning model (including self-efficacy expectations) and a math aptitude/anxiety model for predicting college students' math performance. Results indicated that 55% of the variance in math performance was accounted for by the social learning model compared with 16% for the math aptitude/anxiety model. These studies suggest that the construct of self-efficacy is a useful one for explaining math-related academic choices and achievement.

With the increasing impact of computer technology on the job market a further area for empirical investigation has been computer self-efficacy. Miura (1987) examined sex differences in computer self-efficacy and the relationship between computer self-efficacy and computer interest and enrollment in computer science courses among college students. Male college students reported higher self-efficacy in relation to computer tasks than female college students. Furthermore, computer self-efficacy

expectations were positively related to intentions to take a college computer science course.

Similarly, Vasil, Hesketh, and Podd (1987) found sex differences in computer self-efficacy expectations of high school students. Males reported higher self-efficacy expectations in relation to performing various computer tasks than did females. No evidence was found, however, of females' lower computer self-efficacy decreasing their likelihood of enrolling in high school computer courses.

✓

Attribution Theory

The major theoretical framework guiding much of the research on achievement attributions has been the model proposed by Weiner, Frieze, Kukla, Reed, Rest, and Rosenbaum (1971). The basic premise of attribution theory is that individuals understand behavior in terms of its causes and that differing perceptions of the causes of a behavior result in different psychological consequences. Four major causes of achievement successes and failures have been postulated: ability, effort, luck, and task difficulty. These four causes are classified according to two dimensions: internality and stability. Ability and effort are considered to be internal attributions, whereas luck and task difficulty are classified as external. Furthermore, ability and the task are generally considered stable influences, whereas luck and effort are changeable or unstable.

Sex differences in achievement behavior have been conceptualized using attribution theory. It has been hypothesized that women and men make different causal attributions for their successes and failures, thus partially accounting for women's lower levels of achievement in comparison to men's in a range of fields. Several models of sex differences in causal attributions for success and failure have been postulated. The three most commonly cited models explaining female attributional patterns are the General Externality, the Self-Derogation, and the Low Expectancy models (Frieze, Whitley, Hanusa, & McHugh, 1982).

The General Externality model suggests that women use a general external attribution style, attributing both their successes and failures to external causes such as luck and task difficulty (Bar-Tal & Frieze, 1977; Simon & Feather, 1973). Simon and Feather (1973), unlike many of the other researchers, examined sex differences in performance attributions in a natural setting. It is important to examine performance attributions in real life settings where success and failure have important personal consequences. Simon and Feather (1973) asked 296 male and female college students to make attributions about their performance on a course exam. They found that women made more luck and task difficulty (i.e., external) attributions than did men. This pattern of externality has been accounted for in terms of women's greater fear of both success and of failure, thus

resulting in the ego defensive strategies entailed in appealing to external causes for one's behavior.

The Self-Derogation model (e.g., Heilman & Kram, 1978), in contrast, suggests that women attribute their successes to external factors and their failures to internal factors. The basis for this conceptualization is that individuals attempt to maintain consistent self-perceptions. Therefore, individuals who have low self-esteem are more likely to believe negative information about themselves, whereas individuals who have high self-esteem are more likely to believe positive information about themselves. Thus given that women have low self-esteem in achievement contexts, they will be more likely to incorporate negative information about themselves than positive information (Frieze et al., 1982).

The major proponent of the Low Expectancy model of sex differences in causal attributions is Deaux (1976, 1984). Deaux has posited that sex differences in attributional patterns are related to expectancies for performance. According to this model, the attributional decisions of males and females will not differ unless the initial expectancies for performance differ. Deaux argued that women have lower expectancies for achievement for a range of tasks. The expectancy model posits that when expectancy for success is low, successful performance will be attributed to an unstable cause, such as luck or effort, whereas failure will be attributed to a stable cause, such as lack of

ability. Deaux's concept of expectancy for success is conceptually similar to perceived self-efficacy. Deaux (1976) has also noted that women will have especially low expectations for tasks defined as "masculine." Arguably, conducting research, more so than teaching, is perceived as a masculine activity, thus having implications for the present study.

Therefore, in achievement in an academic context it can be hypothesized that both male and female faculty will have similarly high expectancies for teaching performance, but women will have lower expectancies for research tasks. Thus sex differences in patterns of attributions are predicted to emerge for the latter but not the former.

This highlights the importance of investigating situational variables in studies of sex differences in attributions. McHugh, Frieze, and Hanusa (1982) have noted that research on sex differences in attributional patterns makes the assumption that attributions made by males and females in one situation reflect an enduring attribution style. Given that most studies only examine attributions in one situation such an assumption cannot be made. They concluded:

In order to discern dispositional attributional tendencies, it may be necessary to measure causal attributions across a number of situations, so that situational influences that affect attributions in any one situation do not mislead us as to the general tendency of individuals or groups (e.g., females). (p. 472)

Alternatively, researchers should be wary of generalizing the attributional patterns of groups across tasks and the contexts in which the tasks are performed.

A number of situational variables affect the attributions males and females make. As suggested above, the sex-typing of the task or achievement domain has been found to influence attributions. Deaux and Farris (1977) gave male and female subjects an anagram task and then asked them to explain successful performance. The instructions to the task were manipulated so as to label the task as either masculine or feminine. Sex differences emerged when the task was labelled masculine, with males expecting to do better than the females and explaining performance by ability more than luck. Few differences were found when the task was labelled feminine. Thus when conducting research on sex differences in attributions it is important for researchers to consider aspects of the task and of the context in which the task is performed. For example, males and females may experience the same task very differently, based on cultural and individual perceptions about the sex-appropriateness of the task. In the present study, it is hypothesized that cultural and individual values that have ascribed gender labels to both teaching and research will influence male and female academics' expectancies for performance and their attributions for success and failure in these two performance domains.

Current Status of Women Faculty

Statistics on the status of women in the academic profession indicate a prevailing pattern of inequality. The major generalizations that emerge from the statistics are that women are underrepresented in the academic profession; they are underrepresented in the higher ranks of the profession; they are underrepresented in top ranked research institutions, and they are particularly underrepresented in certain disciplines. Only 28% of all faculty positions in 1985-86 were held by women (American Council on Education, 1989). A breakdown by rank revealed that women faculty were especially underrepresented in senior positions. In 1985-86 women constituted 11.9% of professors, 24.3% of associate professors, 38% of assistant professors, and 52% of instructors (American Council on Education, 1989). The numbers of women professors in prestigious research institutions are even smaller. At Harvard only 4.2% of full professors were women; at Princeton 3.2%, at Stanford 2.6%, and at Yale 3.9% (Kahn, 1984, cited in Robbins & Kahn, 1985).

The underrepresentation of women in academia is nowhere more apparent than in the sciences. Weis (1987) examined data from the National Science Foundation survey of scientific university and college personnel, for the years 1977 and 1984, and found that women constituted only a small proportion of scientific personnel in universities and were clustered in certain select disciplines, such as psychology,

sociology, and life sciences. The data also indicated that there was little significant change between 1977 and 1984. The absence of women professionals in science is most striking in the fields of engineering and the physical sciences (e.g., astronomy, physics, and chemistry). In 1977, women constituted 2% of engineers and 8% of physical scientists employed by universities. The situation changed only marginally in 1984, with women constituting 3.8% of engineering and 9.9% of physical science university personnel. The perplexing question of why women are particularly absent from the sciences merits attention. Recent feminist critiques of science, which posit a male bias in the scientific enterprise, may provide some answers (Keller, 1983, 1985).

On the basis of a review of the literature, Finkelstein (1987) identified two explanations for the lower status of women in comparison to men in the academic profession. The first explanation posits that the relatively low status of women faculty is due to overt discrimination. The second explanation for differential status is differential performance (e.g., productivity). Differential performance has been attributed to a number of different sources, including women's choices (i.e., their different values, orientations, and activity preferences), and differences in educational background and training. Each of these potential explanations for the lower status of women faculty and their empirical support will be reviewed below.

Discriminatory Attitudes

Bernard (1988) distinguished between the more blatant forms of sex discrimination toward female faculty evident in areas such as hiring, tenure practices, and salary, and the subtler discriminatory practices such as "down-putting" and exclusionary behaviors, which she referred to as the "Inferiority Curriculum." A number of studies supporting the contention that the differential status of academic women can be largely attributed to overt discrimination have focused on discriminatory attitudes towards females in academia. Discriminatory attitudes manifested in areas such as, evaluations of written work, letters of recommendation, and teaching evaluations, have in particular received empirical attention.

Evaluations of written work. Paludi and Strayer (1985) examined whether three academic articles in the fields of political science, psychology of women, or education were differentially evaluated by college students on the basis of the gender of the author. Three hundred college students were asked to evaluate an article that was identified as being authored by either a male, a female, or an author with a sexually ambiguous name. The results revealed a pro-male bias, with articles identified as being male-authored receiving more positive evaluations than articles identified as being female-authored. This bias was evident in all three fields, even the supposedly "feminine" and "neutral" fields of psychology of women and education respectively.

It was also found that when articles written by an author with a sexually ambiguous name (e.g. J. T. or Chris) were perceived by subjects as being written by a female, an even stronger bias against female authors was evident in the evaluations.

Letters of recommendation. In a much cited study, Lunneborg and Lillie (1973) conducted a content analysis of letters of recommendation for 123 students admitted to a graduate program in psychology. The purpose of the study was to determine the extent to which sexist comments were present in letters of recommendation. Results revealed that 11 of the 38 female applicants had sexist comments made about them. Most of the sexist statements cited in the study involved extraneous descriptions of the female applicant's physical attractiveness, as exemplified in the following quote: "She is an attractive blond with a quick smile. In an unassuming and natural way, she easily exceeds the usual standards (especially for female graduate students) of pulchritude" (p. 188).

It appears that such blatant sexism is no longer a frequent occurrence in letters of recommendation. Stake, Walker, and Speno (1981) also investigated possible biases against women in letters of recommendation for applicants to a graduate program in psychology. The relationship between sex of applicant and sex of referee was also explored. Letters of recommendation written for 233 male and 177 female applicants were analyzed. No evidence of a

bias against female applicants was found. Results showed that sex of applicant was not significantly related to quality of recommendations. In accordance with the standards of objectivity aspired to in academic evaluation, the applicant's past academic performance was strongly related to quality of letters of recommendation. An interaction between sex of applicant and sex of referee was, however, found. Results indicated that referees described same-sex applicants more positively than opposite-sex applicants. As the authors have noted, this situation may place female applicants at a disadvantage given the small proportion of university faculty that are female, and thus the lower availability of female referees.

Student evaluations. A number of studies have examined sex bias in students' evaluations of college professors' teaching effectiveness. Because teaching evaluations contribute to decisions about the allocation of rewards, such as salary increases and promotions, this research is of considerable importance. Kashak (1981) investigated whether three male and three female professors, described as being award-winning and as using identical teaching methods, would be evaluated differently by college students. Forty male and 40 female college students evaluated written profiles of the six professors on aspects of their teaching, including effectiveness, power, concern, likeability, excellence, and whether the student would take a course from the particular professor. Results showed that male professors were

evaluated as being more powerful and more effective than their female counterparts by both male and female students. It was also found that teaching success was attributed to sex-typed qualities. The success of male professors was seen as being due to instrumental qualities, whereas the success of female professors was seen as being due to affective qualities. A concern in this and other laboratory studies, based on students' ratings of hypothetical professors, is ecological validity. Do college students evaluate male and female professors differentially in real classroom settings?

In a naturalistic study, Martin (1984) asked a sample of 414 college students to rate nine of their professors (three male social scientists, three female social scientists, and three female women's studies faculty) on measures of personality traits and teaching effectiveness. Martin examined whether male and female students had different perceptions of the personality characteristics that contribute to effective teaching and whether these perceptions differed on the basis of the sex of the professor. Martin contended that sex-role expectations and traditional conceptions of power and authority would result in different boundaries for teacher authority for males and females, with female faculty facing the double bind of having to successfully combine "femininity" (e.g., warmth and supportiveness) and "masculine" professionalism (e.g., objectivity and authoritativeness). Thus, Martin (1984)

hypothesized that women faculty who overstepped the boundary in either direction would receive lower student evaluations than those women faculty who combined both elements.

The results supported this hypothesis in the case of male evaluations of female social science instructors. The majority of the variance in male students' evaluations of the teaching effectiveness of female social scientists was accounted for by the personality characteristics of friendliness, smiling, eye-contact, confidence, and decisiveness. According to Martin (1984) these characteristics represent a combination of "feminine" qualities (the former three) and "masculine" qualities (the latter two). In other words, male students gave the highest ratings for teaching effectiveness to those female social scientists who effectively combined feminine and masculine personality characteristics. Male students' ratings of male instructors and female students' ratings of both male and female instructors did not reveal any significant associations between teaching effectiveness and personality attributes. A weakness in this study was that it did not control for the many other variables that influence students' evaluations of college teachers, such as student GPA, the academic rank of the professor, and so forth.

In another naturalistic study, Sidanius and Crane (1989) examined the effect of student and instructor sex on student evaluations of college professors' teaching effectiveness, while controlling for the influence of a

large number of variables. Three dimensions of teaching effectiveness were measured: global teaching effectiveness, competency, and sensitivity to students. This study was based on 9,005 actual teaching evaluations of 401 university faculty collected by a major public university as part of its regular process of evaluation. The results indicated that female faculty were judged as less effective overall and less competent than male faculty by both male and female students, even after controlling for the possible confounding effects of academic rank, student sex, student GPA, student grade expectations, academic discipline, the number of students in the course, and the percentage of women faculty in the department. It was also found that academic competency was more important in students' evaluations of male instructors than in their evaluations of female instructors.

It should be noted that in naturalistic studies investigating potential sex bias in student evaluations of college instructors, such as the above study, researchers have not controlled for the possible confounding influence of teaching effectiveness. In the absence of an objective measure of teaching effectiveness, an alternative explanation for the findings could be that the male professors were superior teachers to their female counterparts, and thus differences in ratings were not due to sex bias. No evidence, however, empirical or anecdotal, exists in the literature to support this explanation.

Furthermore, the findings of Sidanius and Crane (1989) clearly indicate a sex bias in students' evaluations of instructors in that they employ different criteria to assess the teaching effectiveness of male and female faculty—competency being a more salient criterion in judgments of males.

A common thread in all of the above studies examining discriminatory attitudes toward female faculty is the implied devaluation of women's competence. Lott (1985) reviewed research examining differential evaluations of males and females in a diversity of settings, including academia, and concluded that equally competent men and women are not equally evaluated. Lott suggested that the devaluation of a competent woman

may be directly focussed on her performance, or potential performance, or may be reflected in explanations of her success that emphasize luck, effort, or an easy task rather than ability. Or she may be "put down" in the social sphere by being judged less likeable than an equally competent man or a less-competent or non-success oriented woman, and/or judged as "masculine" and less "feminine" than other women in terms of stereotypic attributes or characteristics.
(p. 54)

To the extent that women internalize such discriminatory attitudes, their expectations for performance in various behavioral domains are likely to be diminished.

Salary Discrimination

A major focus in the literature identifying discriminatory practices against female academics has been

the issue of salary discrimination. Statistics indicate that academic women earn less than their male counterparts. In 1982-83 women faculty earned 83% of male faculty's salaries (Simeone, 1987). Robbins and Kahn (1985) reported that in 1984-85 male professors earned 113.5% of women's salaries, associate professors 107.7% and assistant professors 108.8%.

A number of studies have attempted to establish whether the disparities in salaries are due to sex discrimination or other factors. Anderson and Wilson (1985) used regression analysis to examine possible sex discrimination in faculty salaries at a large public university. Results showed trends of lower salaries for female faculty even after controlling for the influence of predictor variables such as rank, college, department, degrees, professional age, years spent at the university, and tenure.

On the basis of a sample of 503 faculty, Ervin, Thomas and Zey-Ferrell (1984) tested a regression model of faculty salary, that incorporated a large number of predictor variables, including sex, work activities, and productivity measures. Results indicated that women earned significantly less than men, even after controlling for the effect of other predictors of salary. It was also found that salary models for males and females differed, with each being rewarded for different characteristics and work activities. For example, males were paid higher salaries for the time they spent conducting research. In contrast, time spent

conducting research did not significantly affect females' salaries. Similarly, the length of time the individual was employed by the university influenced males' salaries but not females' salaries. Thus loyalty to the institution was more likely to be rewarded in the case of male faculty. Furthermore, results showed that the male salary model had greater explanatory power than the female model. In particular, the amount of explained variance increased with the addition of work activity and productivity variables into the male salary model. Thus, as the authors concluded, male faculty were more likely to be rewarded for achievement than were female faculty.

Recently, Thoreson, Kardash, Leuthold, and Morrow (1990) examined sex differences in salaries among a sample of 42 matched pairs of male and female university faculty. No evidence of gender-related salary differences was found. It was reported that female faculty earned 99% of male faculty salaries. Although this finding may be indicative of a positive change in the academic reward structure, it must be interpreted with caution given the small sample size.

Women's Perception of Discrimination

Although the above studies cumulatively point to a variety of discriminatory practices toward female faculty, it is also important to examine the perceptions of sex discrimination of the women themselves. Arguably,

discrimination is most damaging when it is perceived as being discrimination. Research suggests that faculty women do indeed perceive sex discrimination in academia. Reid (1987), for example, surveyed 60 female university faculty and staff and found that 59% believed there was sex discrimination in their academic discipline, and 63% reported there was sex discrimination at the university or in their college. Areas in which discrimination was identified by the respondents included hiring and salaries, promotions, tenure, fringe benefits, and university support for professional development. Reid also found that respondents did not perceive the university as operating as a meritocracy.

Differential Performance

As noted previously, the second explanation for the relatively low status of academic women is differential performance. Furthermore, differential performance has been attributed to various factors, such as women's choices (specifically different values, orientations, and activity preferences) and differences in educational background and experiences (Finkelstein, 1987).

Differences in Values, Orientations, and Activity Preferences

Promotion through the ranks of the academic profession is determined primarily by three factors: teaching,

research, and service to the community (Landino & Owen, 1988). Although different institutions weigh these factors differently, there is a general consensus that research productivity is the major criterion for determining promotion and tenure (Landino & Owen, 1988; Simeone, 1987). Feldt (cited in Landino & Owen, 1988) found that publication in peer-reviewed journals was the only significant predictor of promotion and tenure at a large mid-western research university.

Studies suggest that women invest more time in teaching and less in conducting research, resulting in lower rates of publication compared with men. Simeone (1987) cited a 1980 survey of the Higher Education Research Institute that indicated that women faculty members spent more time teaching and less time conducting research than male faculty. Eleven percent of the female faculty reported spending 17 hours or more per week in teaching compared with 7.5% of the men. In contrast, 13.2% of male faculty compared with 7% of female faculty reported spending 21 hours or more per week doing research. More recently, Schoen and Winocur (1988) found that among a sample of male and female academics, female respondents indicated that they performed teaching tasks more frequently than did male respondents.

The implication of such findings is that concomitant sex differences in research productivity also occur. Helmreich et al. (1980) examined the publication rates and

citations in published works, among a sample of 291 academics in the field of psychology. Results showed significant sex differences in achievement, with males receiving almost four times as many citations and publishing twice as frequently as females. Similarly, Over (1982) found that among a sample of 396 male and female academic psychologists, males published significantly more than females in the 6 years following the publication of their dissertation research.

The gender gap in publication rates may, however, be narrowing. Boice, Shaughnessy, and Pecker (1985) surveyed 304 academic psychologists at doctoral-level universities and found that males and females published at almost equivalent rates, with males publishing on average 7.8 articles and females publishing 7.3 articles over a 3-year period. Sex differences, however, were found in attitudes toward and experiences in publishing. Females were more likely than males to report that they felt excessive pressure to publish and to perceive the editorial process as being biased against females. Thoreson et al. (1990) recently found no significant differences in the research productivity of a sample of 23 matched pairs of male and female university faculty.

A number of factors are likely to contribute to gender differences in the amount of time spent teaching versus doing research, including women having a greater likelihood of not holding a doctorate, a greater representation in

teaching-oriented institutions, fewer professional networks, fewer opportunities for co-authoring and fewer mentors. A further explanation is that female faculty may prefer teaching to conducting research and thus expend greater time and energy on the former activity.

The theoretical work of Gilligan (1982) provides a framework with which to understand why female faculty may be more predisposed towards teaching than doing research. Gilligan has argued that different developmental experiences among males and females give rise to two distinct psychological orientations or "voices." One orientation, which is more characteristic of women, is based on attachment, connectedness, and a commitment to relationships. In contrast, the other orientation, which is more characteristic of men, is based on individuation, separation, and adherence to rules and principles. Gilligan posited that these two different perspectives result in different moral reasoning processes, decision-making, and even world views.

The primacy of relationships in the psychological orientation of women may explain why academic women prefer teaching over the more detached and dispassionate activity of doing research. Although this explanation has some intuitive appeal, it should be noted that Gilligan's theory, particularly the dualism inherent in its assertion of essential and universal differences between males and females, has been criticized. Hare-Mustin and Marecek

(1988), for example, suggested that gender differences can also be attributed to social and power inequities.

Men's propensity to reason from principles may stem from the fact that the principles were formulated to promote their interests; women's concern with relationships can be understood as the need to please others that arises from a lack of power. (p. 459)

Differences in Educational Background and Experiences

Finkelstein (1987) has noted that although higher socioeconomic background is generally associated with attendance at more prestigious educational institutions and more favorable career placement, this relationship does not necessarily hold for women. Female academics tend to come from more privileged backgrounds than male academics (Lipset & Ladd, 1987), but this advantage has not resulted in a concomitant advantage in later career success.

One of the factors that may lessen the benefit of high socioeconomic background for female academics is their greater likelihood of not holding the doctorate. Doctoral education provides an opportunity to develop the research skills necessary for later research and publication productivity, which are strongly correlated with advancement in the academic profession. The American Council on Education (1989) reported that in 1984 the doctorate was the highest degree held by 61% of male faculty compared with 39% of female faculty.

Gender differences in another aspect of graduate education—the development of a mentoring relationship with a faculty member—may also contribute to the lower status of women faculty. The importance of mentoring in the career development of young professionals has been widely noted (Cameron & Blackburn, 1981; Douvan, 1976; Levinson, 1978; Reskin, 1979). Levinson for example, highlighted the importance of the mentor relationship in the psychological development of young adults. According to Levinson, a mentor serves a number of roles, including, acting as a teacher, a sponsor, a host, and guide into a new professional and social sphere, an exemplar or role model, and a counselor providing moral support. Similarly, Cronan-Hillix, Gersheimer, Cronan-Hillix, and Davidson (1986) defined a mentor as "an experienced adult who guides, advises, and supports inexperienced proteges for the purpose of furthering their careers" (p. 123).

A mentor serves several important functions in the professional development of the aspiring academic. These include being a role model, socializing the student into the academic milieu, providing the opportunity for collaboration and early publication, providing access to a network of professional contacts, and assisting in academic job placement. Not surprisingly then, a number of studies have found a relationship between having a mentor and success in the academic profession (Cameron & Blackburn, 1981; Cronan-Hillix et al., 1986; Reskin, 1979).

Reskin (1979) examined the influence of doctoral mentors on the scientific productivity of a sample of 238 graduate chemists in the first 10 years of their careers. Results indicated that sample members who had worked with a productive mentor and had collaborated with their mentor during graduate education had greater predoctoral productivity. It was also found that the professional stature of mentors influenced the types of positions the graduate chemists obtained. Sample members who worked with eminent mentors had a greater likelihood of starting their careers in university tenure-track positions and succeeding in them.

Cronan-Hillix et al. (1986) found that among a sample of 90 psychology graduate students, those who had mentors were more productive than those students who did not. Mentored students had authored more publications, including first-authored publications, conference papers, and had been involved in more research projects since entering graduate school, than students who did not have mentors.

It has been suggested that women have greater difficulty in establishing mentoring relationships in academia than men (Moore, 1982). Given the evidence documenting the benefits of mentoring and the association between mentoring and career success, this claim is of considerable concern. One of the most frequently cited explanations for women's difficulty in finding mentors is the scarcity of women in positions of high status who are

able to serve as role models and mentors (Douvan, 1976; Levinson, 1978). The scarcity of women role models is apparent in academia where, to date, women have made up only small proportions of senior faculty. This is not to obviate the important role many male mentors/role models play in the professional development of women or to suggest that only women can successfully mentor other women. Social learning theory, however, has suggested that people are more likely to be influenced by the behavior of models who are perceived as being similar to them. Accordingly, same-sex models are a more potent source of vicarious learning (Bandura, 1977b).

It has been suggested that female university students' classroom experiences differ from those of males. For example, Hall (1982) in a discussion of various characteristics of the academic environment that disadvantage female students noted that "women's educational experiences may differ considerably from those of men, even when they attend the same institutions, share the same classrooms, and work with the same graduate advisors" (pp. 1-2). A major contributing factor to what Hall (1982) described as a "chilly climate" for women students in academia is male domination of classroom talk.

Sternglanz and Lyberger-Ficek (1977) conducted an observational study of 60 college classrooms to determine if sex differences in student-teacher interactions existed. Results showed that in most classes males were significantly more likely than females to respond to teacher-initiated

interactions and to initiate more of the interactions with teachers, including hand-raising, raising questions, and making statements. Males also spoke longer and more frequently with teachers than did females, primarily due to female students' failure to sustain their interactions with teachers. Karp and Yoels (1975) observed the interaction patterns in 10 university classrooms during the period of one semester and found that in many classes, instructors called on women less frequently than men.

It has also been found that when women students do participate they are more likely to be interrupted by their instructors and by male students (Hall, 1982). McMillan, Clifton, McGrath, and Gale (1977) found in an observational study of 18 problem-solving groups that men interrupted women at least five times as frequently as women interrupted men.

Researchers have identified differences in the speech patterns of males and females (Lakoff, 1975). Differences in speaking styles among male and female students may be a major factor in influencing faculty perceptions of what students say. Patterns of speech that are valued in academia, such as highly assertive speech, impersonal and abstract styles, and competitive "devil's advocate" interchanges, are more prevalent among male than among female speakers (Hall, 1982, p. 9). Hall observed that women's speaking styles share common characteristics with the speech forms of other individuals and groups of lower social

status, including hesitation and false starts, high pitch, tag questions, a questioning intonation when making statements, excessive use of qualifiers, and overly polite and deferential speech forms. Similarly, McMillan et al. (1977) found that women were more likely than men to use linguistic forms that connote uncertainty. This tendency was particularly evident when women were in the presence of men.

Kramarae and Treichler (1990) suggested that gender differences in classroom talk are due in part to differences between male and female students in their attitudes toward and perceptions of power dynamics in the classroom. To investigate students' perceptions of classroom interactions, Kramarae and Treichler (1990) asked a sample of 19 graduate students and 3 instructors to observe a 5-minute taped segment of a graduate humanities seminar in which they had participated. Subjects then commented on their impressions of the taped interaction and also completed a questionnaire about class interaction in general. A number of interesting findings emerged.

Women students were more likely than men to be uncomfortable with power relationships between students and teacher, particularly with teachers who were perceived as being judgmental and who imposed their own positions on others. Male students expressed more concern with course content than with classroom power relationships. Women commented on the lack of collaborative interaction. One student noted, "Students don't try to integrate others'

ideas into their own; they just blow off other ideas when they present their own" (p. 52). Similarly, Belenky, Clinchy, Goldberger, and Tarule (1986) suggested that women are less comfortable with giving voice to their disagreement with others' arguments, preferring instead to look for commonalities in differing positions.

Kramarae and Treichler (1990) also found sex differences in the conditions students believed encouraged their speaking up in class. Women considered the openness and supportiveness of the instructor to be the most important determinant of whether they felt comfortable speaking in class. Men were more concerned with their own mastery and preparation than with characteristics of the teacher. Kramarae and Treichler concluded that a classroom climate that encouraged more unstructured discussion and more collaborative interaction between students and between student and teacher would create greater gender equity in classroom discussion.

Summary

In summary, the review of the literature has suggested that a variety of factors, including discriminatory practices in academia and differential performance among female faculty, contribute to the relatively low status of women academics. As noted previously, although such studies increase our understanding of the reasons for the current status of women faculty, a theoretical framework is needed

to integrate these diverse findings. A model of academic self-efficacy, incorporating both personal and situational variables, may be useful for this purpose.

A review of studies examining the role of self-efficacy in various aspects of career development indicated that strong empirical support exists for the application of self-efficacy theory to the career domain. In the context of academia, however, methodological weaknesses in previous studies examining self-efficacy in university faculty resulted in only partial support for self-efficacy theory. As noted earlier in the chapter, Bandura (1977a, 1986) highlighted the importance of cognitive appraisals of the causes of one's behavior in the development of self-efficacy beliefs. It is likely, therefore, that the inclusion of causal attributions for achievement in a model of academic self-efficacy will increase its explanatory power.

Several models of sex differences in causal attributions for achievement were reviewed. The Low Expectancy model posited by Deaux (1976, 1984) provides a theoretical framework for explaining the relationship between gender, causal attributions, and self-efficacy among university faculty.

CHAPTER 3

RESEARCH METHODOLOGY

Overview

In view of the inability to control for the attribute variables to be investigated in this study, an ex post facto research design was used. On the basis of studies by Schoen and Winocur (1988) and Landino and Owen (1988), research self-efficacy and research performance were examined. In addition, several variables likely to contribute to levels of self-efficacy were examined, including gender, causal attributions for achievement, and research productivity.

Description of Sample and Selection

The subjects of this study were drawn from the population of all full-time faculty at the University of Florida. Full-time faculty were defined as all tenured and nontenured instructional faculty holding the ranks of professor, associate professor, assistant professor, or lecturer. An examination of the most recent demographic data available for University of Florida full-time faculty and all higher education faculty or all public university full-time faculty nationally indicates that University of

Florida faculty are representative of these target populations with respect to major characteristics, such as sex, academic rank, ethnic group, and tenure status (see Tables 1, 2, & 3). University of Florida faculty do differ, however, from faculty nationally in the proportion of women faculty that are tenured. Thirty-nine percent of women faculty at the University of Florida hold tenure compared with 46% nationally.

As suggested by Landino and Owen (1988), sampling did not include those departments whose measures of scholarship and productivity are atypical (e.g., Architecture, Fine Arts and Journalism). The final subpopulation included faculty affiliated with the following academic colleges: Business Administration, Education, Engineering, Health, Food and Agricultural Sciences, Liberal Arts and Sciences, Nursing, and Pharmacy. Table 4 indicates the areas represented and the proportions of male and female faculty in each area at the University of Florida.

From this subpopulation of full-time faculty a random sample was drawn. Random sampling involved two steps. First, a current list of all full-time faculty at the University of Florida was obtained from the Office of Academic Affairs. The list contained the names, addresses, academic rank, sex, and ethnic group membership of faculty grouped by college and department. Departments and individual faculty who did not meet the criteria for inclusion in the survey sample were deleted from the list.

Table 1

Women as a Percentage of Full-time Faculty by Rank

Rank	University of Florida ^a (1987-88)	All public universities ^b (1985-86)
Professor	7.6%	7.1%
Assoc. Professor	19.0%	19.6%
Assist. Professor	23.3%	32.6%

- a. The data in this column are from Office of Academic Affairs (1988)
- b. The data in this column are from American Council on Education (1989)

Table 2

Percentage of Full-time Faculty by Sex and Ethnicity

Ethnic group	University of Florida ^a (1987-88)		All higher ed. institutions ^b (1984)	
	Male	Female	Male	Female
White	92.0%	91.0%	93.3%	93.0%
Black	2.0%	4.0%	1.8%	3.6%
Native-American	0.0%	0.0%	0.0%	0.0%
Spanish-American	1.2%	2.1%	1.2%	1.1%
Asian	4.9%	2.8%	3.1%	1.5%

- a. The data in this column are from Office of Academic Affairs (1988)
- b. The data in this column are from American Council on Education (1989)

Table 3

Percentage of Full-time Faculty with Tenure by Sex

	University of Florida ^a (1987-88)	All higher ed. institutions ^b (1985)
Male	66%	66%
Female	39%	46%

- a. The data in this column are from Office of Academic Affairs (1988)
- b. The data in this column are from American Council on Education (1989)

Table 4

Sex Composition of Subpopulation of University of Florida Faculty by College Affiliation

College	Males		Females	
	n	%	n	%
Business Administration	111	87.4	16	12.6
Education	67	68.4	31	31.6
Engineering	234	96.7	8	3.3
Health & Human Performance	28	62.2	17	37.8
Health Related Professions	38	56.7	29	43.3
Agriculture	424	89.1	52	10.9
Liberal Arts & Sciences	461	80.9	109	19.1
Nursing	4	6.0	63	94.0
Pharmacy	59	81.9	13	18.1
Total	1,426	80.8	338	19.2

The final step in the sampling procedure involved the random selection of the survey sample. In view of the focus on differences that might exist between male and female faculty, a disproportionate stratified random sample with equal numbers of males and females was drawn. The sample comprised 428 individuals. Two hundred and eighty-four faculty responded, constituting a 66% response rate. Statistical analysis was based on 240 responses. Twenty-three questionnaires were returned without responses by faculty who indicated that their positions did not involve research and/or teaching duties. A further 21 unused questionnaires were returned by departmental offices indicating that these faculty were no longer at the University of Florida.

Instruments

A questionnaire was constructed to measure self-efficacy expectations, frequency of performance of research tasks (task saliency), causal attributions for achievement, productivity, and demographic and career variables.

Self-Efficacy Expectations

Self-efficacy was measured using the Academic Self-Efficacy Scale (AS-ES) developed by Schoen and Winocur (1988), which comprises a list of academic tasks in four domains: research, teaching, administration, and

miscellaneous. For the purposes of this study only the research subscale was used. An analysis of the content of the AS-ES research subscale resulted in several items being dropped. Twenty-seven items describing research tasks were retained as being most important. Table 5 shows the academic tasks that make up the research self-efficacy subscale used in the present study.

To assess the strength of self-efficacy beliefs, respondents were asked to rate how confident they are in performing each of the 27 tasks. Confidence ratings for each of the tasks was measured on a 10-point scale ranging from complete confidence to no confidence at all. This procedure follows that used by Betz and Hackett (1983) and Schoen and Winocur (1988). Schoen and Winocur (1988) reported that analysis of the internal consistency of the research subscale, using Cronbach's alpha, yielded a high reliability estimate (.96). Analysis of the internal consistency of the scale, using Cronbach's alpha, on the present sample produced a reliability estimate of .96 also.

Frequency of Performance of Research Tasks

The frequency of performance of research tasks was assessed by asking respondents to indicate how often they perform each of the 27 tasks comprising the research subscale of the AS-ES. Following the format used by Schoen and Winocur (1988) each task was rated on a 5-point Likert-type scale ranging from very often to never. The

Table 5

Tasks on the Research Self-Efficacy Subscale

Research tasks

Delivering research findings at seminars

Submitting papers for publication

Writing journal articles

Analyzing research results

Generating research ideas

Preparing conference papers

Delivering conference papers

Delivering invited research papers in other departments and universities

Developing research interests

Administering research projects

Resubmitting papers/books for publication

Writing research-based books

Collecting data

Collaborating and consulting with colleagues about research

Developing new research skills

Reviewing journal articles

Supervising graduate students

Reading and examining theses/dissertations

Applying for research grants

Training and supervising research assistants

Writing progress and final reports for funding

Supervising students' research projects

Table 5

continued

Research tasks

Reviewing books/texts

Keeping up to date with research literature

Writing text books

Filing and indexing research material

Attending conferences/meetings

internal consistency of the scale was evaluated using Cronbach's alpha, yielding a reliability estimate on the present sample of .93.

Causal Attributions for Achievement

Causal attributions for research performance were measured by asking respondents to indicate the extent to which a hypothetical success (acceptance of a paper submitted for publication) and a hypothetical failure (rejection of a paper submitted for publication) were due to ability, effort, luck, or task ease.

The degree to which respondents perceived ability, effort, luck, and task characteristics as playing a role in each of these two outcomes was assessed on a 5-point Likert-type scale ranging from very significant to not at all significant.

Productivity Index (Research Performance)

The format designed by Thoreson et al. (1990) was used to obtain an index of research productivity. Respondents were asked to indicate (a) the number of presentations they made, (b) the number of reports, articles, book chapters, and books they published, (c) the number of research grants they received and the dollar amount of these grants, and (d) how many of their doctoral advisees graduated, during the past 3 years.

The seven measures were weighted as follows: the number of presentations and reports each counted as one, the number of articles and book chapters were each multiplied by three, the number of books were multiplied by nine, and the number of research grants received and doctoral advisees who graduated were each multiplied by two. The research index was computed by summing the seven weighted scores.

Demographic and Career Information

Demographic information included gender, age, marital status, number of children, years of experience as faculty, academic rank, salary, and academic college affiliation.

Procedures

Pilot Test of Questionnaire

A draft of the questionnaire was administered to a small pilot sample of faculty to ensure that the instructions were clear. Consequently, some minor

modifications were made to the structure and format of the questionnaire.

Procedure

Following the selection of the survey sample, each respondent was mailed the following: a letter describing the nature of the study and requesting participation; a questionnaire comprising measures of research self-efficacy, causal attributions for achievement, and other career and demographic variables, and a self-addressed return envelope. Respondents were requested to return completed questionnaires within 2 weeks of the time they were received. To increase response rate, two further steps were undertaken. First, a reminder letter was mailed to nonrespondents ten days after the initial mailing. Second, 3 weeks after the initial mailing, those sample members who had still failed to respond were sent a second reminder letter and questionnaire. Confidentiality was ensured by the use of a coding system in which no names appeared on the questionnaire data.

Data Analysis

Multiple regression analysis was used to investigate the possible relationships among the variables hypothesized as having an effect on research self-efficacy and on productivity. More specifically, the five hypotheses were tested as follows.

To test Hypothesis 1, a multiple regression analysis was used to determine the effect of research self-efficacy, years of experience, rank, and college affiliation on performance (productivity).

To examine Hypothesis 2, a multiple regression analysis was used to determine the effect of causal attributions and productivity on research self-efficacy.

To test Hypothesis 3, a multiple regression analysis was used to determine the effect of research self-efficacy, faculty gender, and the interaction of faculty gender and research self-efficacy on attributions to each of the four causal factors (ability, effort, luck, task ease/difficulty). Two analyses were conducted for each causal factor, one for attributions for success and one for attributions for failure.

To examine Hypothesis 4, a t-test for independent samples was used to determine whether or not any significant differences existed between male and female faculty in their research self-efficacy beliefs. Sex differences were assessed for the total score on the 27-item "research self-efficacy" scale. A significance level of .05 was used.

To examine Hypothesis 5, a t-test for independent samples was used to determine whether or not any significant differences existed between male and female faculty in the amount of time spent on research tasks. Sex differences were assessed for the total score on the 27-item "frequency

of performance of research tasks" scale. A significance level of .05 was used.

CHAPTER 4

RESULTS

The purpose of this study was to provide an empirical test of a model of academic self-efficacy, in particular examining the relationships between research self-efficacy and research productivity and between research self-efficacy and causal attributions. An additional focus of the study was to examine sex differences among university faculty in their research self-efficacy perceptions, frequency of performance of research tasks, and career and demographic variables. Each faculty member respondent completed a questionnaire that measured research self-efficacy expectations, research productivity, causal attributions, frequency of performance of research tasks, and demographic and career variables.

Description of the Sample

Of the 240 faculty member respondents in this study, 130 (54%) were male and 110 (46%) were female. The average age of respondents was 45.2. Table 6 summarizes the age distribution of respondents. Over 65% of faculty were age 40 or over.

Table 6

Distribution of Faculty Respondents by Age

Age	<u>n</u>	%
20-29	9	3.8
30-39	73	30.4
40-49	85	35.4
50-59	58	24.2
60+	15	6.3
Total	240	100.0

The distribution of faculty member respondents by academic college is shown in Table 7. The College of Liberal Arts and Sciences had the highest percentage of respondents (28%), and the Colleges of Health and Human Performance and Pharmacy had the lowest (5%).

Table 8 shows the distribution of respondents by academic rank. The largest proportion of respondents was full professors (38%). Associate professors and assistant professors were represented in similar proportions (30% and 27% respectively).

Table 7

Distribution of Faculty Respondents by College Affiliation

College	n	%
Business Administration	16	6.7
Education	16	6.7
Engineering	24	10.0
Health & Human Performance	11	4.6
Health Related Professions	14	5.8
Food & Agricultural Sciences	59	24.6
Liberal Arts & Sciences	66	27.5
Nursing	23	9.6
Pharmacy	11	4.6
Total	240	100.0

Table 8

Distribution of Faculty Respondents by Academic Rank

Rank	n	%
Professor	92	38.3
Associate Professor	71	29.6
Assistant Professor	64	26.7
Lecturer	13	5.4
Total	240	100.0

Respondents reported a mean of 13.4 years of work experience as university faculty at the University of Florida and other institutions. As shown in Table 9, over 60% of respondents had 10 or more years of work experience in academia.

Table 10 summarizes the distribution of faculty respondents by marital status. The majority of respondents reported that they were married (75%). As shown in Table 11, the majority of respondents indicated that they had children (69%). The average number of children reported by faculty respondents was 1.5.

To test for the possibility of response bias, specifically that faculty members who responded readily were atypical of the sample as a whole, chi-square analyses were conducted to compare the first group of faculty respondents with the second group of respondents on gender and academic rank. As shown in Tables 12 and 13, no significant differences were found between the two groups of respondents in their gender and academic rank composition. Results of t-tests showed no significant mean differences between the two groups of respondents in age, years of experience as faculty, and 9-month salary (see Table 14).

The total group of respondents were then compared with nonrespondents on gender and academic rank. Results of chi-square analyses showed that respondents and nonrespondents did not significantly differ in gender and academic rank

Table 9

Distribution of Faculty Respondents by Years of Experience

Number of Years of Experience	<u>n</u>	%
0-4	48	20.0
5-9	45	18.8
10-14	51	21.3
15-19	33	13.8
20+	63	26.3
Total	240	100.0

Table 10

Distribution of Faculty Respondents by Marital Status

Marital Status	<u>n</u>	%
Married	167	74.6
Divorced/Separated	29	12.9
Widowed	3	1.3
Never Married	25	11.2
Total	224	100.0

Table 11

Distribution of Faculty Respondents by Parenthood Status

Have children	n	%
Yes	155	68.6
No	71	31.4
Total	226	100.0

Table 12

Distribution of First and Second Groups of Faculty Respondents by Gender

Gender	1st Responses		2nd Responses	
	n	%	n	%
Male	112	54.6	18	51.4
Female	93	45.4	17	48.6

Chi-Square = 0.124, df = 1, p > .05

Table 13

Distribution of First and Second Groups of Faculty Respondents by Academic Rank

Rank	1st Responses		2nd Responses	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
Professor	81	39.5	11	31.4
Assoc. Professor	61	29.8	10	28.6
Assist. Professor	52	25.4	12	34.3
Lecturer	11	5.4	2	5.7

Chi-square = 1.422, df = 3, p > .05

Table 14

Summary of Mean Comparisons of First and Second Groups of Faculty Respondents

Variable	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
Age				
First responses	45.25	8.83		
Second responses	44.68	8.70	0.35	0.35
Years of experience				
First responses	13.46	9.14		
Second responses	13.15	7.72	0.19	0.85
9-month salary				
First responses	42862.02	12860.71		
Second responses	42647.06	15271.75	0.06	0.95

(see Tables 15 and 16). These findings suggest that response bias was not a major problem in the present study.

In order to check for the possibility of "social desirability" effects in the present study, a comparison was made of faculty respondents' reported 9-month salary, for each academic rank subgroup, with actual salary figures computed by the university (see Table 17). Results of t-tests show that reported salaries differed significantly from actual salaries for professors but did not differ for associate and assistant professors.

Results

Hypothesis 1

Hypothesis 1 is that research self-efficacy predicts research performance (productivity) after controlling for the effects of years of experience, academic rank, and college affiliation.

Multiple regression analyses were used to examine whether research self-efficacy had a significant effect on productivity after controlling for the influence of years of experience, academic rank, and college affiliation. Two regression models were tested with productivity as the dependent variable (see Table 18). The first regression model included experience, rank, and college affiliation as predictor variables. Research self-efficacy was included in the regression equation (Model 2) to examine whether it

Table 15

Distribution of Respondents and Nonrespondents by Gender

Gender	Respondents		Nonrespondents	
	<u>n</u>	%	<u>n</u>	%
Male	130	54.2	78	54.2
Female	110	45.8	66	45.8

Chi-square = 0.000, df = 1, p > .05

Table 16

Distribution of Respondent and Nonrespondents by Academic Rank

Rank	Respondents		Nonrespondents	
	<u>n</u>	%	<u>n</u>	%
Professor	92	38.3	62	43.1
Assoc. Professor	71	29.6	45	31.3
Assist. Professor	64	26.7	29	20.1
Lecturer	13	5.4	8	5.6

Chi-square = 2.170, df = 3, p > .05

Table 17

Mean 9-month Salary by Academic Rank

Rank	Faculty Respondents	University of Florida ^a	<u>t</u>
Professor	52,756	56,030	-3.12 [*]
Assoc. Professor	40,154	39,365	1.24
Assist. Professor	36,592	36,322	0.39

a. The data in this column are from Office of Academic Affairs (1990)

* $p < .05$

Table 18

Regression of Productivity on Research Self-Efficacy, Years of Experience, Rank, and College Affiliation

	Beta	t	R ²	R ² inc	df
<u>Model 1</u>			0.301 [*]		12,230
Experience	-1.216	-4.79 [*]			
Rank ^a					
Full Professor	50.297	5.48 [*]			
Assoc. Professor	31.856	3.76 [*]			
Assist. Professor	15.082	1.90			
College ^b					
Business	-25.929	-2.73 [*]			
Education	-23.406	-2.49 [*]			
Engineering	-10.553	-1.21			
Health & Human Performance	-17.758	-1.69			
Health Related Professions	-29.917	-3.11 [*]			
Food & Agricultural Sciences	-9.245	-1.67			
Liberal Arts & Sciences	-19.779	-2.52 [*]			
Nursing	-24.656	-2.75 [*]			
<u>Model 2</u>			0.377 [*]	0.076 [*]	13,191 [*]
Self-Efficacy	0.211	3.47 [*]			
Experience	-1.114	-4.06 [*]			

Table 18

Continued

	Beta	t	R ²	R ² inc	df
Rank					
Full Professor	39.096	3.68*			
Assoc. Professor	21.932	2.29*			
Assist. Professor	8.076	0.93			
College					
Business	-30.293	-2.94*			
Education	-23.428	-2.44*			
Engineering	-9.706	-1.06			
Health & Human Performance	-14.670	-1.37			
Health Related Professions	-29.874	-2.98*			
Food & Agricultural Sciences	-5.860	-0.70			
Liberal Arts & Sciences	-24.348	-2.89*			
Nursing	-20.570	-2.23*			

Note: Significance of R² and R² increase based on F tests.

- a. Rank = 3 dummy variables. The rank of lecturer is not represented to avoid redundancy.
(each dummy = 1; all others including lecturer = 0).
- b. College = 8 dummy variables. The College of Pharmacy is not represented to avoid redundancy.
(each dummy = 1; all others including College of Pharmacy = 0).

* $p < .05$

explained any unique variance in productivity over and above that explained by the predictor variables in Model 1.

As shown in the table, years of experience, academic rank, and college affiliation (Model 1) explained a large and significant proportion of the variance in productivity. When self-efficacy was included in the regression equation (Model 2) 38% of the variance in productivity was accounted for. The R^2 increase was significant, indicating that self-efficacy explained unique variance in productivity, after controlling for the effects of experience, rank, and college affiliation. On the basis of the data analysis, the null hypothesis was rejected, and hypothesis 1 was accepted.

Hypothesis 2

Hypothesis 2 is that causal attributions will explain additional variance in research self-efficacy, over and above that explained by research productivity. Regression analyses were conducted to determine the effects of causal attributions and productivity on research self-efficacy.

Two regression models were tested with research self-efficacy as the dependent variable (see Table 19). The first model examined the effect of productivity on research self-efficacy. The second model examined the effects of productivity and causal attributions on research self-efficacy. To test whether the addition of causal attributions (Model 2) resulted in a significant increase

Table 19

Regression of Research Self-Efficacy on Productivity and Causal Attributions

	Beta	t	R^2	R^2_{inc}	df
<u>Model 1</u>			0.118*		1,195
Productivity	0.381	5.09*			
<u>Model 2</u>			0.228*	0.110*	9,179
Productivity	0.369	4.83*			
Ability (Success)	10.729	3.69*			
Effort (Success)	0.089	0.04			
Luck (Success)	0.322	0.15			
Task (Success)	-0.151	-0.08			
Ability (Failure)	-3.149	-1.64			
Effort (Failure)	1.155	0.66			
Luck (Failure)	-0.849	-0.41			
Task (Failure)	-2.496	-1.39			

Note. Significance of R^2 and R^2 increase based on F tests.

* $p < .05$

in the proportion of explained variance in research self-efficacy required an examination of the increment on R^2 .

As shown in the table, productivity alone (Model 1) explained 12% of the variance in research self-efficacy. When causal attributions were included in the regression model (Model 2), 23% of the variance in research self-efficacy was explained. Results of an F test indicated that the R^2 increase (0.11) was significant ($p < .05$). Thus the inclusion of causal attributions in the regression equation added significantly to the prediction of research self-efficacy. On the basis of these results, the null hypothesis was rejected, and hypothesis 2 was accepted.

An examination of the regression coefficients of the explanatory variables showed that only productivity and ability attributions to explain a successful outcome reached significance individually (see Table 19). Therefore the influence of productivity on faculty members' research self-efficacy beliefs was associated primarily with their attributions to ability to explain a successful outcome. Attributing a successful outcome to ability significantly increased perceptions of self-efficacy. Attributions to ability to explain an unsuccessful outcome and to other causal factors to explain both successful and unsuccessful outcomes did not significantly affect research self-efficacy beliefs.

Hypothesis 3

Hypothesis 3 is that self-efficacy beliefs interact with faculty sex to influence causal attributions. In other words, the magnitude of sex differences in attributions varies with self-efficacy beliefs.

A series of multiple regression analyses were used to determine the effect of research self-efficacy, faculty sex, and a product term representing the interaction of research self-efficacy and faculty sex on attributions to each of the four causal factors (ability, effort, luck, task ease/difficulty). For each causal factor, two analyses were conducted, one for attributions for a successful outcome and one for attributions for an unsuccessful outcome.

Attributions for Success

Table 20 contains the results of a regression analysis with attributions to ability to explain a successful outcome as the dependent variable. The regression coefficient for the product term failed to reach significance, indicating that the interaction between research self-efficacy and faculty sex did not affect ability attributions. The model explained a significant amount of variance in ability attributions ($R^2 = 0.077$, $p < .05$), although only self-efficacy yielded a significant regression coefficient.

Table 21 shows the results of a regression analysis with attributions to effort to explain a successful outcome as the dependent variable. The regression coefficients of

Table 20

Regression of Ability Attributions to Explain Success on Research Self-Efficacy, Faculty Sex, and the Interaction of Research Self-Efficacy and Faculty Sex

	Beta	<u>t</u>	R^2	<u>df</u>
			0.077*	3,195
Intercept	4.425	7.59*		
Efficacy	0.009	3.03*		
Sex	0.653	0.84		
Efficacy x Sex	-0.002	-0.62		

Note. Significance of R^2 based on F test.

* $p < .05$

Table 21

Regression of Effort Attributions to Explain Success on Research Self-Efficacy, Faculty Sex, and the Interaction of Research Self-Efficacy and Faculty Sex

	Beta	<u>t</u>	R^2	<u>df</u>
			0.025	3,195
Intercept	5.431	8.06*		
Efficacy	0.005	1.38		
Sex	-0.036	-0.04		
Efficacy x Sex	0.001	0.14		

Note. Significance of R^2 based on F test.

* $p < .05$

all three explanatory variables were nonsignificant. Furthermore, the regression model failed to explain a significant amount of the variance in effort attributions ($R^2 = 0.025$, $p > .05$).

Table 22 contains the results of a regression analysis with attributions to luck to explain a successful outcome as the dependent variable. The model predicted a significant amount of variance in luck attributions ($R^2 = 0.096$, $p < .05$). The product term yielded a significant regression coefficient (0.026 , $p < .05$), indicating that research self-efficacy beliefs interact with faculty sex to influence luck attributions. Separate regression equations for the relationship between self-efficacy and luck attributions were obtained for males and females:

Males: Luck Attributions = $7.50 - .02(\text{EFFICACY})$

Females: Luck Attributions = $3.01 + .01(\text{EFFICACY})$

A graphic representation of the two equations is shown in Figure 1. As can be seen on the graph, as self-efficacy increased, luck attributions to explain a successful outcome decreased for males but increased for females. In other words, more confident males were less likely to attribute their successes to luck, whereas more confident females were more likely to attribute their successes to luck.

The results of a regression analysis with task attributions to explain a successful outcome are shown in Table 23. The model accounted for 8% of the variance in task attributions ($p < .05$). The interaction between

Table 22

Regression of Luck Attributions to Explain Success on Research Self-Efficacy, Faculty Sex, and the Interaction of Research Self-Efficacy and Faculty Sex

	Beta	<u>t</u>	<u>R</u> ²	<u>df</u>
			0.096 [*]	3,195
Intercept	7.504	6.06 [*]		
Efficacy	-0.022	-3.61 [*]		
Sex	-4.494	-2.74 [*]		
Efficacy x Sex	0.026	3.13 [*]		

Note. Significance of R² based on F test.

* p < .05

Table 23

Regression of Task Attributions to Explain Success on Research Self-Efficacy, Faculty Sex, and the Interaction of Research Self-Efficacy and Faculty Sex

	Beta	<u>t</u>	<u>R</u> ²	<u>df</u>
			0.075 [*]	3,183
Intercept	6.722	5.07		
Efficacy	-0.017	-2.55 [*]		
Sex	-2.910	-1.64		
Efficacy x Sex	0.018	2.05 [*]		

Note. Significance of R² based on F test.

* p < .05

research self-efficacy and faculty sex was found to be significant ($0.018, p < .05$). Separate regression equations for the relationship between self-efficacy and task attributions were obtained for males and females:

Males: Task Attributions = $6.72 - .02(\text{EFFICACY})$

Females: Task Attributions = $3.81 + .00(\text{EFFICACY})$

Figure 2 provides a graphic representation of the two regression equations. As shown on the graph, as self-efficacy increased, task attributions decreased for males and remained the same for females. More confident males were less likely to attribute a successful outcome to the ease of the task. Confidence did not affect task attributions for females.

Attributions for Failure

Table 24 shows the results of a regression analysis with ability attributions to explain an unsuccessful outcome as the dependent variable. A significant amount of the variance in ability attributions was explained ($R^2 = 0.040, p < .05$). The regression coefficient for the product term was significant ($-0.017, p < .05$), indicating that research self-efficacy beliefs interact with faculty sex to influence ability attributions. Two separate regression equations for the relationship between self-efficacy and ability attributions were obtained for males and females:

Males: Ability Attributions = $4.24 + .01(\text{EFFICACY})$

Females: Ability Attributions = $7.16 - .01(\text{EFFICACY})$

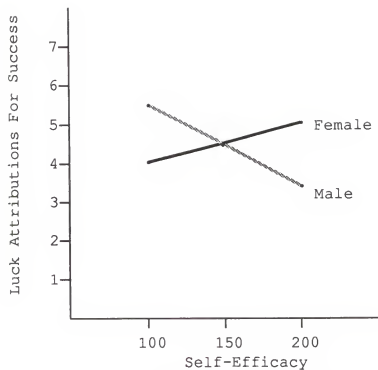


Figure 1. Male and Female Regression Lines For Luck Attributions For Success on Self-Efficacy

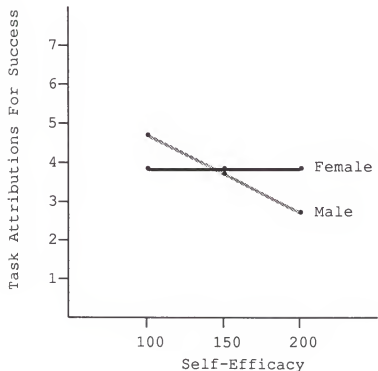


Figure 2. Male and Female Regression Lines For Task Attributions For Success on Self-Efficacy

A graphic representation of the two regression equations is presented in Figure 3. As can be seen in the graph, as self-efficacy increased, ability attributions increased for males but decreased for females. In other words, more confident males were more likely to attribute an unsuccessful outcome to lack of ability, whereas more confident females were less likely to attribute an unsuccessful outcome to lack of ability.

The results of a regression analysis with effort attributions to explain an unsuccessful outcome as the dependent variable are summarized in Table 25. Although the model predicted a significant amount of the variance in effort attributions ($R^2 = 0.041$, $p < .05$), all three of the individual explanatory variables, including the interaction variable, yielded nonsignificant regression coefficients.

Table 26 shows the results of a regression analysis with luck attributions to explain an unsuccessful outcome as the dependent variable. A significant amount of the variance in luck attributions was explained by the model ($R^2 = 0.075$, $p < .05$). The interaction between research self-efficacy and faculty sex yielded a significant regression coefficient (0.027 , $p < .05$). Two separate regression equations for the relationship between self-efficacy and luck attributions were obtained for males and females:

Males: Luck Attributions = $7.56 - .02(\text{EFFICACY})$

Females: Luck Attributions = $2.67 + .01(\text{EFFICACY})$

Table 24

Regression of Ability Attributions to Explain Failure on Research Self-Efficacy, Faculty Sex, and the Interaction of Research Self-Efficacy and Faculty Sex

	Beta	<u>t</u>	<u>R</u> ²	<u>df</u>
			0.040 [*]	3,191
Intercept	4.241	3.61 [*]		
Efficacy	0.007	1.15		
Sex	2.924	1.89		
Efficacy x Sex	-0.017	-2.18 [*]		

Note. Significance of R² based on F test.

* p < .05

Table 25

Regression of Effort Attributions to Explain Failure on Research Self-Efficacy, Faculty Sex, and the Interaction of Research Self-Efficacy and Faculty Sex

	Beta	<u>t</u>	<u>R</u> ²	<u>df</u>
			0.041 [*]	3,191
Intercept	4.369	3.39 [*]		
Efficacy	0.007	1.11		
Sex	1.707	1.01		
Efficacy x Sex	-0.012	-1.39		

Note. Significance of R² based on F test.

* p < .05

Figure 4 shows a graphic representation of the two regression equations. As can be seen on the graph, as self-efficacy increased, luck attributions decreased for males but increased for females. Thus more confident males were less likely to attribute an unsuccessful outcome to luck, whereas more confident females were more likely to attribute an unsuccessful outcome to luck.

Table 27 shows the results of a regression analysis with task attributions to explain an unsuccessful outcome as the dependent variable. The model predicted a significant amount of the variance in task attributions ($R^2 = 0.075$, $p < .05$), although only research self-efficacy yielded a significant regression coefficient. The product term failed to reach significance, indicating that the interaction between research self-efficacy and faculty sex did not influence task attributions.

In summary, results provided partial support for the hypothesis. Self-efficacy beliefs interacted with faculty gender to influence luck attributions to explain both a successful and an unsuccessful outcome, task attributions to explain a successful outcome, and ability attributions to explain an unsuccessful outcome. The interaction term did not influence ability attributions to explain a successful outcome, effort attributions to explain both a successful and an unsuccessful outcome, or task attributions to explain an unsuccessful outcome. Appendix C contains a table of correlations for the attribution ratings.

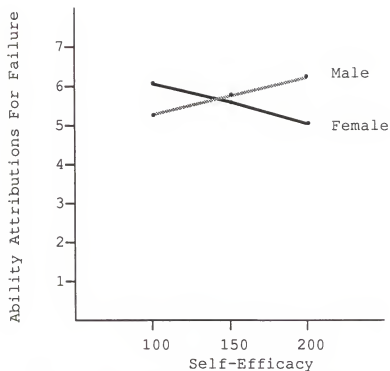


Figure 3. Male and Female Regression Lines For Ability Attributions For Failure on Self-Efficacy

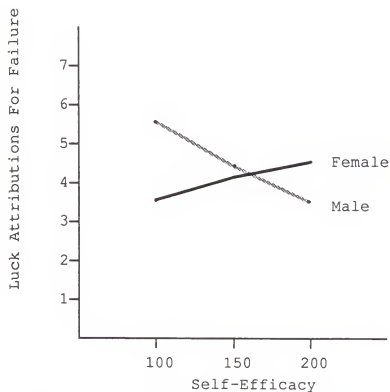


Figure 4. Male and Female Regression Lines For Luck Attributions For Failure on Self-Efficacy

Table 26

Regression of Luck Attributions to Explain Failure on Research Self-Efficacy, Faculty Sex, and the Interaction of Research Self-Efficacy and Faculty Sex

	Beta	<u>t</u>	<u>R</u> ²	<u>df</u>
			0.075 [*]	3,191
Intercept	7.561	5.69 [*]		
Efficacy	-0.021	-3.22 [*]		
Sex	-4.888	-2.79 [*]		
Efficacy x Sex	0.027	3.09 [*]		

Note. Significance of R² based on F test.

* p < .05

Table 27

Regression of Task Attributions to Explain Failure on Research Self-Efficacy, Faculty Sex, and the Interaction of Research Self-Efficacy and Faculty Sex

	Beta	<u>t</u>	<u>R</u> ²	<u>df</u>
			0.075 [*]	3,181
Intercept	7.348	5.31 [*]		
Efficacy	-0.018	-2.59 [*]		
Sex	-2.527	-1.37		
Efficacy x Sex	0.016	1.78		

Note. Significance of R² based on F test.

* p < .05

Hypothesis 4

Hypothesis 4 is that the research self-efficacy beliefs of female faculty are lower than those of male faculty. A t -test for independent samples was used to determine if there were statistically significant differences between male and female faculty members' total scores on the 27-item "research self-efficacy" scale. The data analysis indicated that male faculty members were significantly more confident than female faculty members about their performance of research tasks (see Table 28).

In summary, on the basis of these results, the null hypothesis was rejected, and hypothesis 4 was accepted. In other words, male and female faculty differed significantly in their research self-efficacy beliefs, with males reporting greater confidence.

Hypothesis 5

Hypothesis 5 is that female faculty invest less time in the performance of research tasks than male faculty. A t -test for independent samples was used to examine whether statistically significant differences existed between male and female faculty members' total scores on the 27-item "frequency of performance of research tasks" scale. As shown in Table 29, male faculty reported spending significantly more time on research activities than female faculty.

Table 28

Sex Differences Among Male and Female Faculty in Research Self-Efficacy

	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
Males (<u>n</u> =108)	7.46	1.03		
Females (<u>n</u> =90)	7.10	1.25	2.23	0.02 [*]

Note. Responses were obtained on a 10-point scale ranging from no confidence at all (0) to complete confidence (9).

* $p < .05$

Table 29

Sex Differences Among Faculty Members in the Performance of Research Tasks

	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
Males (<u>n</u> =117)	3.26	0.65		
Females (<u>n</u> =101)	3.05	0.76	2.15	0.03 [*]

Note. Responses were obtained on a 5-point scale ranging from never (1) to very often (5).

* $p < .05$

In summary, on the basis of the data analysis, the null hypothesis was rejected, and hypothesis 5 was accepted. In other words, male and female faculty differed significantly in their reports of how frequently they performed research tasks, with males reporting greater frequency.

Supplementary Results

In view of the focus on differences that might exist between male and female faculty, a series of post-hoc analyses were conducted. The purpose of these analyses was descriptive rather than being aimed at testing specific hypotheses.

A series of t-tests for independent samples were computed to examine whether statistically significant differences existed between male and female faculty on measures of age, years of experience, 9-month salary, the productivity index, and the individual indices that were combined into the productivity index (i.e., the number of reports, articles, book chapters, and books published, the number of presentations made, the number and dollar amount of grants received, and the number of doctoral advisees who graduated in a 3-year period). The results of these analyses are summarized in Table 30.

Significant mean differences between male and female faculty were obtained for years of experience, 9-month salary, the productivity index, the number of reports and articles published, and the number of grants received. In

Table 30

Summary of Post-Hoc Gender Comparisons

Variable	M	SD	t	p
Age				
Males	45.84	8.81		
Females	44.35	8.75	1.29	0.19
Years of experience				
Males	14.91	9.36		
Females	11.63	8.08	2.85	0.00*
9-month salary				
Males	47337.49	12512.65		
Females	37110.33	11504.48	5.41	0.00*
Productivity Index				
Males	44.89	31.03		
Females	31.74	21.45	3.71	0.00*
Number of reports				
Males	4.91	8.43		
Females	2.48	4.02	2.76	0.01*
Number of articles				
Males	6.39	5.30		
Females	3.95	3.55	4.19	0.00*
Number of book chapters				
Males	1.34	1.53		
Females	1.43	1.80	-0.42	0.68
Number of books				
Males	0.38	0.78		
Females	0.39	0.68	-0.06	0.95
Number of presentations				
Males	5.54	5.43		
Females	5.46	4.88	0.12	0.90
Number of grants				
Males	2.73	3.19		
Females	1.31	1.70	4.17	0.00*
Dollar amount of grants				
Males	198455.06	439424.57		
Females	123613.37	369209.14	1.39	0.17

Table 30
Continued

Variable	<u>M</u>	<u>SD</u>	<u>t</u>	<u>p</u>
Number of doctoral advisees who graduated				
Males	1.12	1.71		
Females	0.73	1.48	1.88	0.06

* $p < .05$

each comparison males had the higher mean. Thus male faculty reported significantly more years of experience, a higher nine-month salary, higher overall research productivity, a greater number of published reports and articles, and a greater number of research grants received.

To examine whether faculty gender had an effect on salary, after controlling for productivity, years of experience, academic rank, and college affiliation, two multiple regression models were tested with salary as the dependent variable (see Table 31).

The first model, comprising productivity, experience, rank, and college affiliation as predictor variables, explained a significant proportion (62%) of the variance in salary. Sex was included in the regression equation (Model 2) to examine whether it explained any unique variance in salary over and above that explained by productivity, years of experience, academic rank, and college affiliation.

Table 31

Regression of 9-Month Salary on Sex, Productivity,
Experience, Rank, and College Affiliation

	Beta	t	R ²	R ² inc	df
<u>Model 1</u>			0.619 [*]		13,159
Productivity	62.949	2.07 [*]			
Experience	90.891	0.79			
Rank ^a					
Full Professor	23984.826	5.84 [*]			
Assoc. Professor	12586.822	3.59 [*]			
Asst. Professor	10101.517	3.11 [*]			
College ^b					
Business	19713.490	4.26 [*]			
Education	-4075.196	0.92			
Engineering	11631.724	2.76 [*]			
Health & Human Performance	1471.347	0.31			
Health Related Professions	223.478	0.05			
Food & Agricultural Sciences	706.258	0.18			
Liberal Arts & Sciences	1812.359	0.46			
Nursing	-68.649	-0.01			
<u>Model 2</u>			0.634 [*]	0.015 [*]	14,159 [*]
Sex	-3791.406	-2.43 [*]			
Productivity	49.801	1.64			
Experience	24.546	0.21			

Table 31
Continued

	Beta	t	R ²	R ² inc	df
Rank					
Full Professor	23626.351	5.85*			
Assoc. Professor	11884.123	3.44*			
Asst. Professor	8978.473	2.78*			
College					
Business	19576.391	4.29*			
Education	-3548.350	-0.82			
Engineering	9907.130	2.36*			
Health & Human Performance	1015.726	0.22			
Health Related Professions	137.698	0.03			
Food & Agricultural Sciences	-380.548	-0.09			
Liberal Arts & Sciences	1842.975	0.48			
Nursing	1306.815	0.27			

Note. Significance of R^2 and R^2 increase based on F tests.

- a. Rank = 3 dummy variables. The rank of lecturer is not represented to avoid redundancy.
(each dummy = 1; all others including lecturer = 0).
- b. College = 8 dummy variables. The College of Pharmacy is not represented to avoid redundancy.
(each dummy = 1; all others including College of Pharmacy = 0).

* $p < .05$

As shown in the table, when sex was added to the regression model (Model 2) 63% of the variance in salary was explained. Results of an F test showed that the increment in R^2 (.015) was significant ($p < .05$). Thus, sex explained unique variance in salary after controlling for productivity, experience, rank, and college affiliation.

Several chi-square analyses were computed to examine whether statistically significant differences existed between male and female faculty on reported measures of academic rank, marital, and parenthood status. Table 32 shows data on sex differences among faculty member respondents in academic rank. As can be seen in the table, significantly more male than female faculty were concentrated in the higher ranks. For example, 78% of males were full or associate professors compared with 56% of female faculty.

The distribution of male and female faculty by marital status is presented in Table 33. As shown in the table, significant sex differences emerged. For example, a larger proportion of males than females reported being married (90% and 57% respectively). More females than males reported being divorced/separated (21% and 6% respectively) and having never been married (19% vs. 4%).

Table 34 presents data on male and female faculty members' reported parenthood status. Results show that significantly more females than males reported not having any children (44% and 21% respectively).

Table 32
Sex Differences in Academic Rank

Rank	Males		Females		Total	
	<u>n</u>	%	<u>n</u>	%	<u>n</u>	%
Professor	61	46.9	31	28.2	92	38.3
Assoc. Professor	40	30.8	31	28.2	71	29.6
Assist. Professor	29	22.3	35	31.8	64	26.7
Lecturer	0	0.0	13	11.8	13	5.4

Chi-square = 22.98, df = 3, p < .05

Table 33
Sex Differences in Marital Status

Marital Status	Males		Females		Total	
	<u>n</u>	%	<u>n</u>	%	<u>n</u>	%
Married	108	90.0	59	56.7	167	74.6
Divorced/ Separated	7	5.8	22	21.2	29	12.9
Widowed	0	0.0	3	2.9	3	1.3
Never Married	5	4.2	20	19.2	25	11.2

Chi-square = 33.16, df = 3, p < .05

Table 34

Sex Differences in Parenthood Status

Have Children	Males		Females		Total	
	<u>n</u>	%	<u>n</u>	%	<u>n</u>	%
Yes	96	79.3	59	56.2	155	68.6
No	25	20.7	46	43.8	71	31.4

Chi-square = 13.9, df = 1, p < .05

CHAPTER 5

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

This chapter summarizes the results of data analyses presented in Chapter 4 and provides interpretations drawn from the findings. Recommendations for future research are also discussed. First, several methodological concerns arising from this study are highlighted.

Limitations of the Study

The instruments used in this study were self-report, thus allowing for the possibility that "social desirability" effects may have influenced responses. In view of this possibility a validity check was conducted that compared faculty respondents' reported 9-month salaries for each academic rank subgroup with salary records obtained from the university administration. As shown in Chapter 4, respondents' reported salaries for two of the three rank subgroups were not significantly different from salary figures reported by the university. However, professors reported higher salaries than the figures reported by the university.

Because participation in this study was voluntary, responses may reflect some systematic bias. However, as

shown in Chapter 4, comparisons of the demographic characteristics of faculty members who responded readily to the survey with those respondents who required a second reminder revealed no significant differences between the two groups. In addition, no differences were found between respondents and nonrespondents on gender and academic rank. These findings suggest respondents were representative of the initial sample. The initial sample was representative of the population except that professors with higher salaries were overrepresented.

A third concern relates to the measurement of causal attributions. On the basis of the model proposed by Weiner et al. (1971) and previous research, four causal factors were investigated in the present study (ability, effort, luck and task ease/difficulty). Several respondents, however, noted that other causal factors, more specifically related to the hypothetical outcomes under investigation, were of greater importance. These included factors such as "the politics of reviewers," "whether the article was right for that journal at that time," "the timeliness of the topic," and "journal choice and editors." Although arguably these more specific causal factors could be perceived as "luck," some responses may have been affected by the lack of specificity and limited number of causal factors available. Unfortunately, there is no way of determining on a post hoc basis the extent to which this occurred.

Overview

The purpose of this study was to test a model of research self-efficacy empirically. Specifically, the aim of the study was to extend the theoretical model by testing additional important relationships, such as the relationships between research self-efficacy and research performance and between research self-efficacy and causal attributions. A further goal of the study was to examine sex differences among university faculty in their self-efficacy beliefs and in other related variables.

Each faculty member sampled was sent a questionnaire that measured research self-efficacy beliefs, research productivity, causal attributions, frequency of performance of research tasks, and demographic and career information. Two hundred and forty faculty members completed questionnaires that were used in the statistical analysis.

Data analysis of the responses included multiple regression analyses and t-tests for independent samples to test the hypotheses. T-tests for independent samples and chi-square analyses were used to determine if there were any statistically significant differences between male and female faculty on a number of variables.

Results provided empirical support for the research self-efficacy model. The relationships between research self-efficacy and research productivity and between research self-efficacy and causal attributions were found to be statistically significant. Partial support was found for

Deaux's (1984) Low Expectancy model of sex differences in attributional patterns. Significant sex differences in the expected direction emerged in self-efficacy beliefs and the frequency of performance of research activities. Male faculty members reported significantly higher self-efficacy perceptions and spent significantly more time performing research tasks than did female faculty.

Discussion

Self-Efficacy Theory

Although assuming that self-efficacy influences performance, researchers (Landino & Owen, 1988; Schoen & Winocur, 1988) who conducted studies of self-efficacy in university faculty did not test this relationship. As noted previously, a full test of Bandura's (1986) self-efficacy model necessitates establishing the link between self-efficacy expectations and overt behavior.

In the present study the relationship between research self-efficacy beliefs and research productivity (performance) was tested. Results showed that research self-efficacy was positively correlated with research productivity. Thus productivity increased, as self-efficacy perceptions increased. A significant proportion of the variance in productivity was explained by self-efficacy after controlling for the effects of years of experience, academic rank, and college affiliation. The present findings, therefore, provided empirical support for

self-efficacy theory, specifically Bandura's (1986) contention that self-efficacy expectations are related to behavior.

Bandura (1977a, 1986) postulated that a major source of information by which self-efficacy beliefs are learned and modified are performance accomplishments or successful performances of the behavior. Landino and Owen (1988) noted that in the academic domain, performance accomplishments are likely to be one of the most salient sources of efficacy information.

As noted in Chapter 2, Bandura (1977a, 1986), however, has asserted that efficacy information such as successful performance will not influence self-efficacy beliefs unless this information is appropriately appraised by the individual. In the present study, a cognitive appraisal that was considered to be of importance in an academic setting was the individual's causal attributions for success and failure. Thus it was hypothesized that attributions about the causes of success and failure experiences would be related to research self-efficacy.

Results showed that the addition of causal attributions, specifically ability attributions to explain success, to the regression equation consisting of productivity alone contributed a significant increment to the variance explained in self-efficacy. In other words, attributing a successful outcome to ability significantly increased perceptions of self-efficacy.

Thus findings support the incorporation of causal attributions for achievement in models of academic self-efficacy. Furthermore, the results support Kazdin's (1979) contention that cognitive appraisal is an important consideration in self-efficacy theory.

Attribution Theory

As noted in Chapter 2, three commonly cited models for explaining sex differences in attributional styles are the General Externality, the Self-Derogation, and the Low Expectancy models. According to the Low Expectancy model proposed by Deaux (1984), sex differences in attributional patterns are related to expectancies for performance. Thus, the attributional decisions of males and females will not differ unless the initial expectancies for performance differ. This model of sex differences in attributional patterns was tested in the present study, operationalizing expectancies for performance as self-efficacy expectations.

Results showed that the magnitude of sex differences in causal attributions was dependent on self-efficacy beliefs for attributions to luck to explain success and failure, attributions to the ease of the task to explain success, and attributions to lack of ability to explain failure. Thus, in four of the eight analyses, the attributions of male and female university faculty varied with their self-efficacy beliefs. Although the interaction term was not significant for the other four regression analyses, main effects by sex

failed to reach statistical significance. These findings lend support to the contention that sex differences in any behavior are typically qualified by interactions with situational and social variables (Deaux, 1984).

The results of the analyses that yielded significant interaction terms showed that increases in self-efficacy were associated with (a) an increase in the tendency to explain success in terms of good luck among females, and a decrease in the tendency among males, (b) a decrease in the tendency to explain success in terms of the ease of the task among males and no change among females, (c) a decrease in the tendency to explain a failure in terms of lack of ability among females and an increase in the tendency among males, and (d) an increase in the tendency to explain a failure in terms of bad luck among females and a decrease in the tendency among males.

Interpretation of the present findings in light of Deaux's (1984) framework provides mixed support for the model. Deaux suggested that when individuals have low expectancies for performance, success is perceived as being inconsistent with this expectation and is therefore explained in terms of an unstable cause (e.g., luck), while failure is perceived as being consistent with this expectation and thus is explained in terms of a stable and internal cause (e.g., lack of ability). In contrast, when individuals have high expectancies for performance, success is perceived as consistent with this expectation and is

therefore attributed to a stable and internal cause (e.g., ability), while failure is perceived as being inconsistent with this expectation and is thus attributed to an unstable cause (e.g., bad luck).

In the present study, low expectations for performance among women were associated with explaining failure in terms of a stable and internal cause (i.e., lack of ability). They were, however, also correlated with explaining failure in terms of an unstable cause (i.e., bad luck). Lower self-efficacy among women was not associated with explaining success in terms of an unstable cause. High expectations for performance among males was not found to be associated with explaining success in terms of a stable and internal cause, nor was it associated with explaining failure in terms of an unstable cause. In conclusion, the results provided partial support for Deaux's Low Expectancy model of sex differences in attributional patterns.

It was found that among faculty women lower levels of self-efficacy were associated with a tendency to explain a publication rejection in terms of lack of ability. Such negative interpretations of failure experiences are likely to further reduce confidence. This finding, however, was counterbalanced by the finding that lower levels of self-efficacy among females were also associated with an increase in attributions to luck to explain failure. Attributions to luck are less likely to be damaging to confidence.

Sex Differences

The analyses of data revealed significant differences between male and female faculty in a number of areas. As predicted, males reported significantly stronger research self-efficacy beliefs than did females. In other words, male faculty were more confident than female faculty of their ability to perform research tasks. These findings are similar to those of Landino and Owen (1988) and Schoen and Winocur (1988) who also examined academic self-efficacy perceptions among male and female university faculty. The critical question, however, is whether sex differences in self-efficacy beliefs are manifest in actual performance. Thus, are female faculty members' weaker research self-efficacy beliefs related to lower research productivity?

As noted earlier, results of a regression analysis showed that research self-efficacy was positively related to productivity. Thus, greater confidence levels predicted greater productivity. It was also found that female faculty reported significantly lower productivity rates than male faculty. Males' overall productivity, as assessed by a weighted index comprising measures of the number of books, book chapters, articles and reports published, grants received, and doctoral advisees who graduated over a 3-year period, was significantly higher than that of females. More specifically, significant differences emerged between male and female faculty in the average number of articles

published in a 3-year period (6.4 and 3.9 respectively), the number of reports published in a 3-year period (4.9 and 2.5), and the number of grants received in a 3-year period (2.7 and 1.3).

These results are of considerable importance given that in most research universities promotion and tenure are based on research productivity (Landino & Owen, 1988). The results of the present study suggest that the concept of research self-efficacy may have utility for conceptualizing and explaining gender-related differences in research productivity. An implication of the findings is that within the prevailing academic reward structure female faculty appear to be at a disadvantage due to their lower confidence and concomitant lower productivity. It should be noted that in some colleges where the proportions of female faculty were greatest (e.g., nursing), many faculty do not hold or have only recently acquired doctoral degrees. This may have contributed to observed sex differences in research self-efficacy and productivity.

The present findings are not consistent with previous studies that have suggested that the gender gap in publication rates may be narrowing (e.g., Boice et al., 1985; Thoreson et al., 1990). Boice et al. (1985), however, only examined publication rates among academic psychologists therefore limiting the generalizability of their findings to faculty in other academic disciplines. Thus, although publication rates for males and females may be converging in

psychology, the same may not be true in other disciplines such as engineering and the physical sciences. The present sample comprised faculty across a wide range of academic fields, including a number of male-dominated fields, thus perhaps accounting for the presence of sex differences. Thoreson et al. (1990) examined productivity rates among faculty across five academic colleges; however, the small sample size (46) suggests the possibility of instability of estimates obtained.

Previous research has suggested that women publish less because they invest more time in teaching and less in research activities (Simeone, 1987). Although sex differences in the proportions of time spent in teaching and research were not investigated in the present study, results did show that male faculty reported performing research tasks significantly more frequently than did female faculty. Whether this was due to female faculty spending more time in teaching-related activities or having less proclivity towards conducting research than male faculty merits further consideration.

Some of the literature on the status of women in academia has attributed women's relatively low status in the profession to overt discriminatory practices, such as salary discrimination (e.g., Robbins & Kahn, 1985; Simeone, 1987). In the present study males reported earning a significantly higher 9-month salary than females. Furthermore, gender predicted salary even after controlling for productivity,

academic rank, years of experience, and college affiliation. Results showed that being female was negatively related to salary. In other words, even after controlling for background variables, women earned \$3,800 less than men. These findings are in accordance with earlier research that found similar evidence of sex differences in faculty salaries after controlling for a variety of background variables (Ervin et al., 1984).

Previous research has suggested that faculty women are less likely to be married and have children than faculty men. For example, Andruskiw and Howe (cited in Simeone, 1987) found that among a sample of top level academic administrators 10 times as many women as men were never married, twice as many women as men were divorced, and 5 times as many women as men had no children. In the present study chi-square analyses revealed significant sex differences in marital and parenthood status, although of a lesser magnitude than those reported by Andruskiw and Howe. Results showed that among the present sample of faculty, four times as many women as men were never married, three times as many women as men were divorced or separated, and twice as many women as men had no children. Additional research is needed to explicate the reasons for these differences. For example, is there greater attrition from the profession by women strongly committed to family roles, thus accounting for the greater proportion of faculty women who are single and who do not have children? If this is

indeed the case, then greater institutional support for faculty women with family responsibilities (such as provision of daycare) may help to remediate this situation.

Recommendations for Further Study

Additional research is needed to replicate this study with a wider sample of university faculty. For example, in academic institutions with similar proportions of male and female faculty, different patterns of gender differences in confidence and performance may be observed.

As noted previously, Bandura (1977a, 1986) identified four major factors or sources of information that contribute to self-efficacy beliefs (performance accomplishments, vicarious learning, verbal support, and emotional arousal). In the present study, the focus was on the relationship between performance and self-efficacy. Further research is needed to operationalize and test the influence of the other sources of information on the self-efficacy beliefs of male and female faculty.

Cognitive appraisals of self-efficacy information play an important role in influencing whether the information is integrated by the individual. In the present study causal attributions increased the amount of variance in research self-efficacy explained by performance accomplishments. Further study should be directed at determining what other types of cognitive appraisals are necessary in order for efficacy information to be incorporated. For example, other

factors that may influence whether performance accomplishments change individuals' self-efficacy beliefs are the perceived difficulty of the task and the perceived amount of effort expended.

Further research should also be directed at studying research self-efficacy in relation to other variables that may influence research performance. For example, it is likely that in addition to self-efficacy beliefs, constructs derived from expectancy-value theory (Ajzen & Fishbein, 1980; Mitchell & Beach, 1976) would increase the amount of variance explained in research productivity among university faculty. Thus it can be predicted that the outcomes that university faculty believe will result as a consequence of their behavior and the value they attach to these outcomes will influence performance.

Finally, to further explore academic self-efficacy and performance in faculty women, it would be valuable for researchers to conduct qualitative studies of various groups of faculty women. Such research may enhance our understanding of the complexity of personal and situational factors that contribute to the lower levels of confidence and performance among faculty women.

APPENDIX A
LETTER TO FACULTY

Foundations of Education
1403 Norman Hall
University of Florida

January 14, 1991

Dear Faculty Member:

I am a Ph.D. candidate in Educational Psychology under the direction of Dr. Patricia Ashton. As part of my doctoral research I am conducting a survey of faculty attitudes towards various professional behaviors. Your name has been randomly selected as part of a sample of University of Florida faculty. Your participation is vital for the completion of this study and would be very much appreciated.

The questionnaire should require only a few minutes of your time. A numerical coding system will be used to ensure confidentiality of your responses.

Please return the questionnaire in the enclosed envelope, via campus mail, by January 28, 1991. Please let me know if you would like the results of the study. I would be happy to provide you with a summary as soon as it is available.

Thank you in advance for your participation in this study.

Sincerely,

Latika Vasil

APPENDIX B
SURVEY OF FACULTY ATTITUDES

1. Using the scale below please rate how confident you feel in performing each of the research tasks listed.

COMPLETE CONFIDENCE	9 8 7 6 5 4 3 2 1 0	NO CONFIDENCE AT ALL
------------------------	---------------------	-------------------------

(Please circle the appropriate number)

Delivering research findings at seminars	9	8	7	6	5	4	3	2	1	0
Submitting papers for publication	9	8	7	6	5	4	3	2	1	0
Writing journal articles	9	8	7	6	5	4	3	2	1	0
Analyzing research results	9	8	7	6	5	4	3	2	1	0
Generating research ideas	9	8	7	6	5	4	3	2	1	0
Preparing conference papers	9	8	7	6	5	4	3	2	1	0
Delivering conference papers	9	8	7	6	5	4	3	2	1	0
Delivering invited research papers in other departments and universities	9	8	7	6	5	4	3	2	1	0
Developing research interests	9	8	7	6	5	4	3	2	1	0
Administering research projects	9	8	7	6	5	4	3	2	1	0
Resubmitting papers/books for publication	9	8	7	6	5	4	3	2	1	0
Writing research-based books	9	8	7	6	5	4	3	2	1	0
Collecting data	9	8	7	6	5	4	3	2	1	0
Collaborating and consulting with colleagues about research	9	8	7	6	5	4	3	2	1	0
Developing new research skills	9	8	7	6	5	4	3	2	1	0
Reviewing journal articles	9	8	7	6	5	4	3	2	1	0
Supervising graduate students	9	8	7	6	5	4	3	2	1	0
Reading and examining theses/dissertations	9	8	7	6	5	4	3	2	1	0
Applying for research grants	9	8	7	6	5	4	3	2	1	0
Training and supervising research assistants	9	8	7	6	5	4	3	2	1	0

Writing progress & final reports for funding	9	8	7	6	5	4	3	2	1	0
Supervising students' research projects	9	8	7	6	5	4	3	2	1	0
Reviewing books/texts	9	8	7	6	5	4	3	2	1	0
Keeping up to date with research literature	9	8	7	6	5	4	3	2	1	0
Writing text books	9	8	7	6	5	4	3	2	1	0
Filing and indexing research material	9	8	7	6	5	4	3	2	1	0
Attending conferences/meetings	9	8	7	6	5	4	3	2	1	0

2. Assume that you submitted a paper for publication and it was accepted. Using the scale below please rate how important you think each of the following factors would be in contributing to this outcome?

IMPORTANT 7 6 5 4 3 2 1 UNIMPORTANT

(Please circle the appropriate number)

Ability	7	6	5	4	3	2	1
Effort	7	6	5	4	3	2	1
Luck	7	6	5	4	3	2	1
Task Ease	7	6	5	4	3	2	1

3. Assume that you submitted a paper for publication and it was rejected. Using the scale below please rate how important you think each of the following factors would be in contributing to this outcome?

IMPORTANT 7 6 5 4 3 2 1 UNIMPORTANT

(Please circle the appropriate number)

Ability	7	6	5	4	3	2	1
Effort	7	6	5	4	3	2	1
Luck	7	6	5	4	3	2	1
Task Difficulty	7	6	5	4	3	2	1

4. During the past three years, how many of each of the following did you have published?
- Reports _____
 Refereed Articles _____
 Book chapters _____
 Books _____
5. During the past three years, how many presentations at national conferences did you make? _____
6. During the past three years, how many research grants did you receive? _____
 For a total of how many dollars? _____
7. During the past three years, how many of your doctoral advisees graduated? _____
8. Using the scale below, please indicate how often you perform each of the research tasks listed.

VERY OFTEN 5 4 3 2 1 NEVER

(Please circle the appropriate number)

Delivering research findings at seminars	5	4	3	2	1
Submitting papers for publication	5	4	3	2	1
Writing journal articles	5	4	3	2	1
Analyzing research results	5	4	3	2	1
Generating research ideas	5	4	3	2	1
Preparing conference papers	5	4	3	2	1
Delivering conference papers	5	4	3	2	1
Delivering invited research papers in other departments and universities	5	4	3	2	1
Developing research interests	5	4	3	2	1
Administering research projects	5	4	3	2	1
Resubmitting papers/books for publication	5	4	3	2	1
Writing research-based books	5	4	3	2	1

Collecting data	5	4	3	2	1
Collaborating and consulting with colleagues about research	5	4	3	2	1
Developing new research skills	5	4	3	2	1
Reviewing journal articles	5	4	3	2	1
Supervising graduate students	5	4	3	2	1
Reading and examining theses/dissertations	5	4	3	2	1
Applying for research grants	5	4	3	2	1
Training and supervising research assistants	5	4	3	2	1
Writing progress and final reports for funding	5	4	3	2	1
Supervising students' research projects	5	4	3	2	1
Reviewing books/texts	5	4	3	2	1
Keeping up to date with research literature	5	4	3	2	1
Writing text books	5	4	3	2	1
Filing and indexing research material	5	4	3	2	1
Attending conferences/meetings	5	4	3	2	1

DEMOGRAPHIC INFORMATION

9. What is your sex? MALE _____ FEMALE _____
10. What is your age? _____
11. What is your faculty rank? _____
12. How many years have you been employed as full-time university faculty at this and other institutions?

13. What is your present marital status? (Please circle letter)

a. Married

c. Widowed

b. Divorced/Separated

d. Never Married

14. Do you have any children? YES/NO If yes, how many?

15. What is your 9 month salary? _____

***** THANK YOU FOR YOUR COOPERATION *****

APPENDIX C
INTERCORRELATION MATRIX

Table 35
Correlations of Causal Attributions

	(Success)					(Failure)		
	Ab	Eff	Luck	Task	Ab	Eff	Luck	Task
Ability (Success)		.331*	-.158*	-.007	.305*	.142*	-.122	.032
Effort (Success)			-.077	.034	.063	.315*	-.061	.093
Luck (Success)				.197*	-.160*	-.102	.790*	.231*
Task (Success)					.155*	.165*	.146*	.755*
Ability (Failure)						.621*	-.229*	.091
Effort (Failure)							-.143*	.157*
Luck (Failure)								.252*
Task (Failure)								

* $p < .05$

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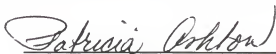
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BIOGRAPHICAL SKETCH

Latika Vasil was born in India, on August 23, 1962. She emigrated with her family to New Zealand in 1967. In 1983 she graduated from Victoria University of Wellington with a Bachelor of Arts degree in psychology and political science. She moved to Palmerston North in 1984 where she attended Massey University, obtaining a Master of Arts degree in psychology in 1985. After graduating she returned to Wellington and worked as a researcher for the Policy and Research Units of both the Departments of Education and Justice.

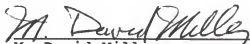
She moved to the United States in 1987 and began doctoral studies at the University of Florida. During her graduate course of study she worked as both a research and a teaching assistant in the Foundations of Education Department.

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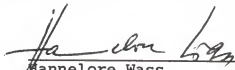
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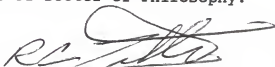
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